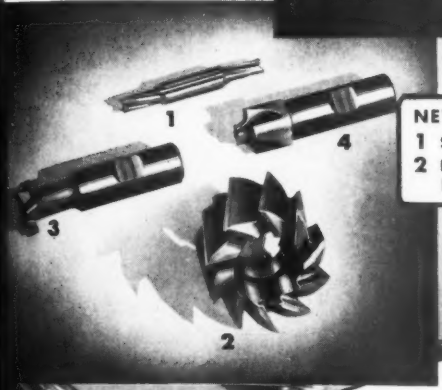
NOVEMBER, 1944

TOOL & DIE JOURNAL

TOOLING AND PRODUCTION



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THE TOOL & DIE JOURNAL

GEORGE J. HUEBNER • EDITOR, PUBLISHER

Technical Editor, E. WILLARD PENNINGTON **Assistant Editor, PAUL L. REED**

Contents

Vol. X, No. 8 **November, 1944**

Feature Articles Index	97
Editorial, George J. Huebner	99
Feature Articles	101
Industrial Plastics	115
Progress-on-Parade	137
Industrial Digest	149
Publication Previews	165
Shop Aids	183
Advertisers' Index	241

The Tool & Die Journal is published monthly for those industry key men who are responsible for designing, building and using precision tooling

Controlled Circulation — CBI Coverage • Official Publication: Tool & Die Institute

PUBLICATION OFFICE

2460 Fairmount Boulevard, Cleveland 6, Ohio

CATHRYN H. EVANS, Business Manager **MARY D. VECCIA, Production Manager**

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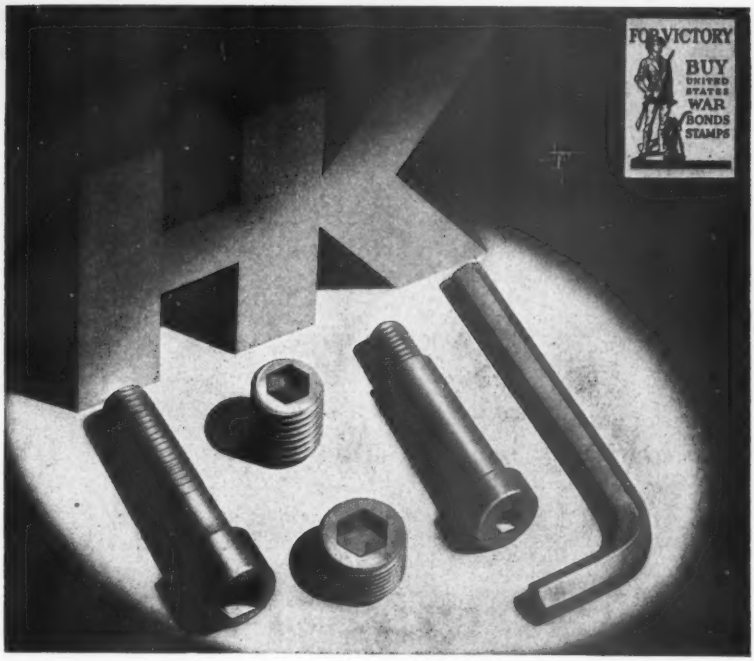
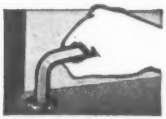
LEADERS LOOK AHEAD



Industries, today actively engaged in producing war-time essentials, are also thoughtfully planning for the future . . . Just ahead are vast unexplored markets, in addition to the more familiar ones. To satisfy these, new machinery and machine tools, unique parts and gadgets are being created and blue-printed. Every component part is being studied to be certain it will give the performance and do the job for which it is intended . . . Yes, Leaders *are* Looking Ahead—preparing for "the day"!



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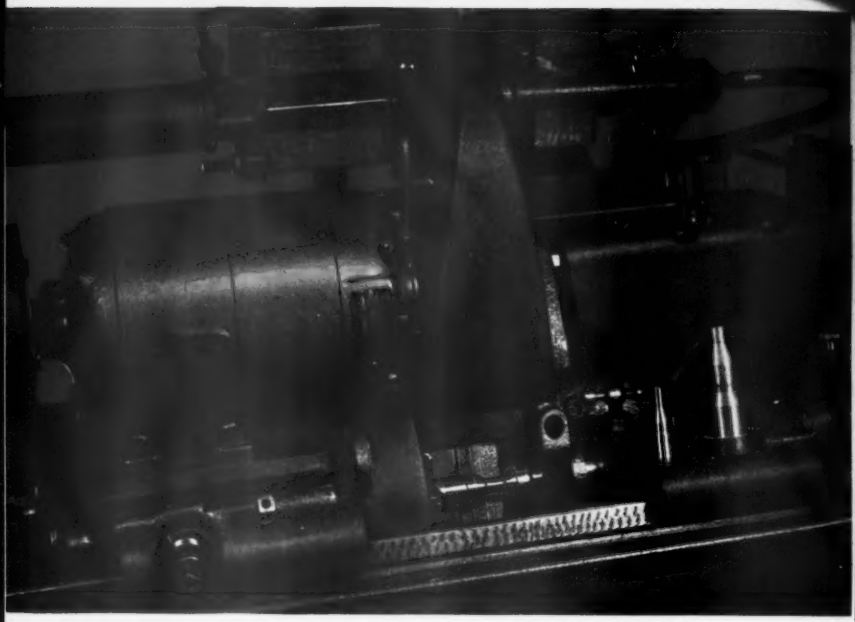


Infeed PROFILE GRIND

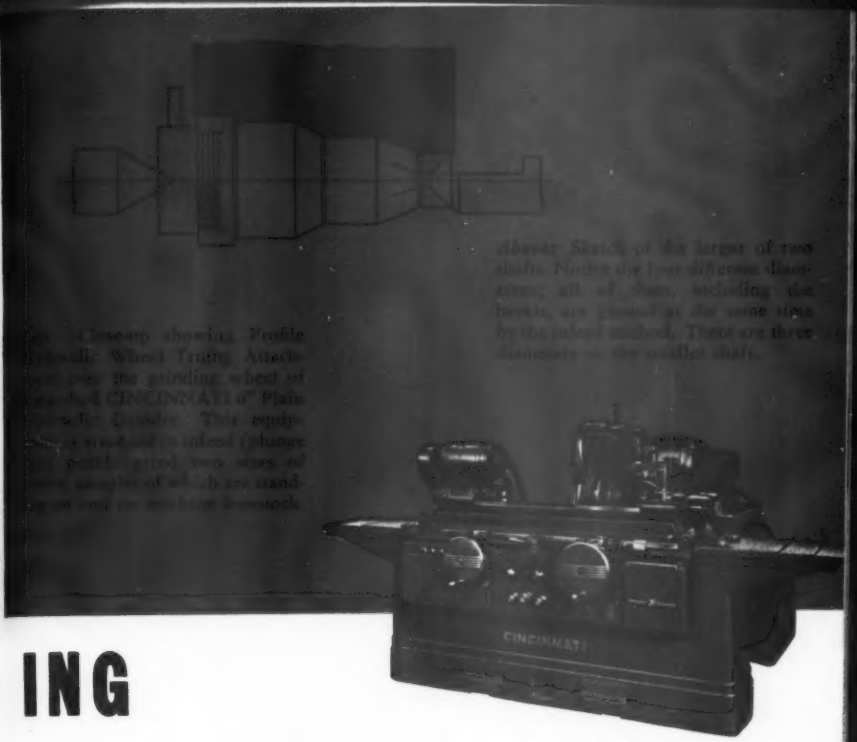
Four Diameters and Two Bevels on Cincin

Grinding four diameters and two bevels, all at the same time by the infeed method, is quite a job, especially when necessary to hold a tolerance of .0005". To handle this type of work, CINCINNATI Application Engineers tooled up a CINCINNATI 6" Plain Hydraulic Grinder with the following equipment:

1. Profile hydraulic wheel truing attachment.
2. Extra wide wheels, with suitable wheel mounts and guards.
3. Hydraulic footstock.
4. Automatic infeed attachment.

The equipment is designed to handle two shafts; one having four diameters and two bevels, and the other having three diameters and one bevel. Although the machine is comparatively small, its FILMATIC spindle bearings and

TOOL ROOM AND MANUFACTURING MILLING MACHINES · SURFACE BROACHING MACHINES · CUTTER SHARPENING



ING

nati 6" Plain Hydraulic

overall rigid construction make it possible to take these unusually wide cuts. Here again, CINCINNATI Application Engineers have demonstrated that standard machines, slightly modified, or with extra equipment, are suitable for precision grinding special jobs. Perhaps some precision operation in your manufacturing process could be handled more efficiently. Why not talk it over with the engineers here at Grinding Headquarters?

Above: CINCINNATI 6" Plain Hydraulic Grinding Machine. Catalog G-492-2 gives complete specifications. For a brief description of all CINCINNATI Grinding Machines, look in Sweet's Catalog File for Mechanical Industries.

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MACHINES . . . CENTERTYPE GRINDING MACHINES . . . CENTERLESS GRINDING MACHINES . . . CENTERLESS LAPPING MACHI

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No. 3 (large) . . .	3 1/8"	4"	8 1/8"

Machine Tool Manufacturers strongly emphasize the need, not only to set machines level, but to keep 'em that way. Periodic re-leveling is essential for accurate work tolerances. How often, depends on the type of foundation. No method of machine setting is stable enough to maintain the accuracy of initial leveling. It is important to check after first month of operation, then check periodically and re-level whenever necessary.

When a machine is set on EMPCO JACKS, the whole operation is the work of but a moment: Simply apply a wrench to the "hex" screw head, turn right or left until your level indicator reads "zero".

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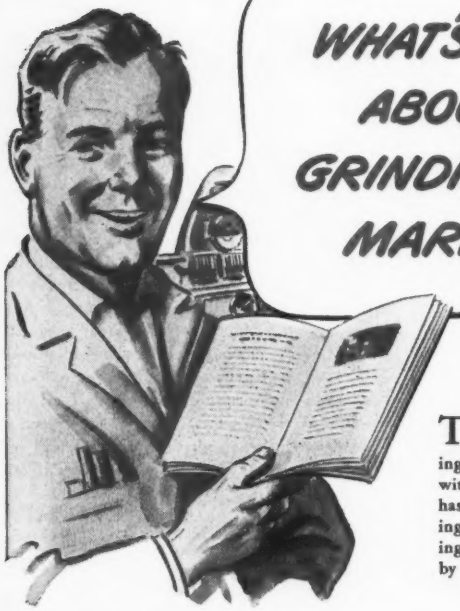

WHAT'S ALL THIS ABOUT NEW GRINDING WHEEL MARKINGS!

THAT'S right—from now on it's going to be a lot easier to get the right grinding wheel for the job! Carborundum, along with all other makers of grinding wheels, has adopted a new system of wheel markings. ✳ The new system is one of marking only. So wheels with similar markings by different makers may not grind alike.

This new book gives you a clear understanding of the new markings on Wheels by Carborundum and the grades they indicate. It's also full of information on the proper selection, identification, specification, use and care of grinding wheels.

But it does more than that! It includes additional information about the complete Carborundum line, the most complete line of abrasives made and sold under one brand name. It is one of the most useful manuals on abrasives ever published! To get your copy promptly, fill out the coupon and mail today to The Carborundum Company, Niagara Falls, New York. And for help with *any* abrasive problem, consult your Carborundum Representative!

✳ *Effective soon, these new markings will appear on all Grinding Wheels sold by Carborundum. Because so many of these wheels are in use in industry, it may take a little while before the transition is complete. For as long as is necessary to help our customers, Grinding Wheels by Carborundum will carry both the old and new markings.*

YOU NEED THIS BOOK TO SELECT THE RIGHT GRINDING WHEEL FOR THE JOB!

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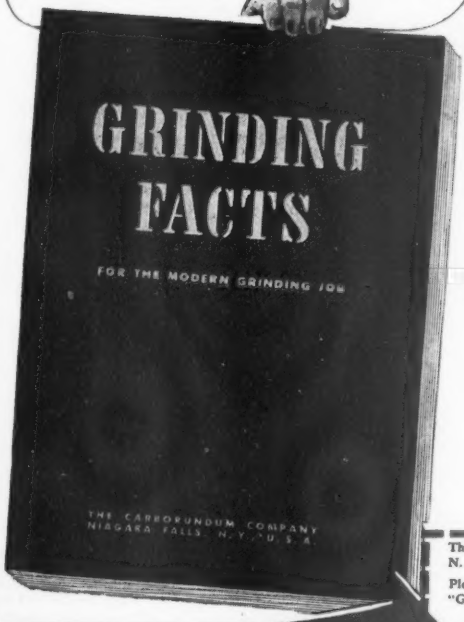
PRODUCT FOR EVERY ABRASIVE APPLICATION

IT'S ALL IN THIS NEW BOOK BY CARBORUNDUM!



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1. The fundamentals of Wheel Marking
2. The new Carborundum Wheel Markings
3. Factors to consider when selecting a Wheel
4. Care and Handling of Grinding Wheels
5. The 9 Standard Wheel Shapes
6. Basic Grinding Wheel Functions
7. Types of Grinding Operations
8. Diamond Wheels
9. Green Grit Wheels
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11. Thread Grinding Wheels
12. Cutting-Off Wheels
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17. Wheel Speeds

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GRINDER ACCURACY *Safeguards*

WORKERS' LIVES

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Accurate dimensions of the die illustrated above control the pressure of the explosive packed into detonators at a shell loading plant. Obviously, exact dimensions of this die are mandatory.

The operator finish grinds the die (within a tolerance of .001") with a No. 5 Dumore Grinder and DC Quill. The stability, accuracy and controllability of this tool enables him to meet the exacting requirements of the Ordnance Department, guarantee the safe and effective loading of the detonators and maintain essential high production.

If precision grinding at low cost would be a valuable factor in your production, ask your local distributor for more detailed information on Dumore Grinders — or write to The Dumore Company, Tool Division, Dept. TL42, Racine, Wisconsin.

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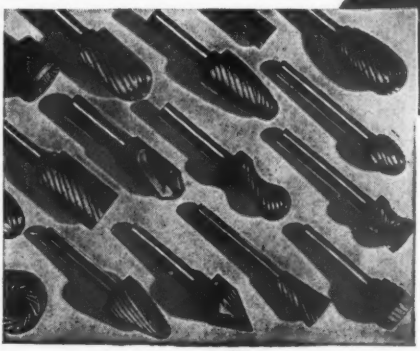
If your production calls for perfectly finished seats, you simply can't beat Severance Chatterless Countersinks. In a few seconds, they produce a finish that will stand up to a commercial ground job. Using a standard type, a finish sufficiently smooth for valve seatings may be obtained. Because of their staggered tooth design, they take clean, shearing cuts—thereby eliminating chatter. Available with any angle and in a wide variety of diameters, lengths and shanks. Heavy duty types have tang shanks and may be used with a Glenzer sleeve. Write today for complete facts about how Severance Chatterless Countersinks can solve your counter-sinking problem.



Severance Midget Milling Cutters and special cutting tools of many types are available, with Severance tooth design, for finishing every kind of wood, plastic, metal and alloy. These fast-working tools take sharp bites, throw off clean chips. For best service, order new cutters and send your worn cutters for regrinding to the nearest Severance plant.

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The Erickson Precision Collet Chuck is outstanding for its super gripping strength and ability to maintain accuracy.

Erickson Engineers regularly solve problems for many types of manufacturers anxious to improve results and profit by savings through proper handling of work.

Uses and applications of the chuck to fit your requirements will gladly be recommended upon request.

U. S. Patents No. 2,228,685. Other patents pending.

The ERICKSON COLLET

OPEN SLOTTED BOTH ENDS

COLLAPSES 1/32" MAINTAINS GRIPPING STRENGTH and ACCURACY

High speeds and heavy feeds may be used, as the 8 point grip and extreme accuracy of concentricity avoid vibration and loosening.

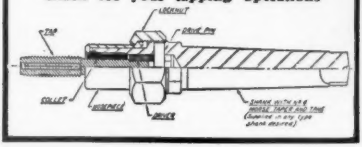
One Erickson Collet Replaces, at least, 7 Single Purpose Collets

The ERICKSON EXPANDING MANDREL

Uses an inverted adaptation of The Erickson Collet. Inquiries solicited for your requirements.

The ERICKSON TAPPING CHUCK

An outstanding new development. Send for information covering this chuck for your tapping operations



ERICKSON CHUCKS ARE STANDARD EQUIPMENT ON MANY MODERN MACHINES

Leading manufacturers of newer equipment have been quick to recognize in the Erickson Chuck, a gripping means that adds to the accuracy and precision of their products. Inquire about Erickson Chucks for standard equipment.

ERICKSON STEEL CO. Dept. A

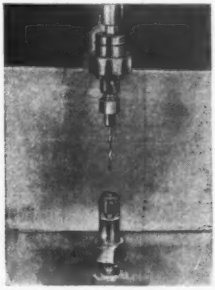
mitting precision and accuracy ★ ★
from the machine to the job

Model 201 High Speed Router Chuck with extended nose piece for pattern following.

Main and auxiliary turrets equipped with Erickson Chucks. Note short drill overhang, taps and reamers.

Model 102 Chuck—adapted for standard floating holder operations.

Models 102 and 402 Chucks in use on Automatic Screw Machine.



Model 301 Chuck adapted to quick change production operation on upper spindle. Note self-contained, interchangeable drill bushings in special nose piece on lower chuck.

Vertical Milling operation with 101 Chuck.

Horizontal Miller with 102 Chuck used to hold Woodruff Key Cutter.

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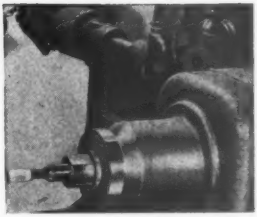

Model 301 Chuck designed for high speed internal grinding operations.

Model 201 used in drill press. Extra long drills can be used, by extending them from the chuck as they wear.

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McKINNEY
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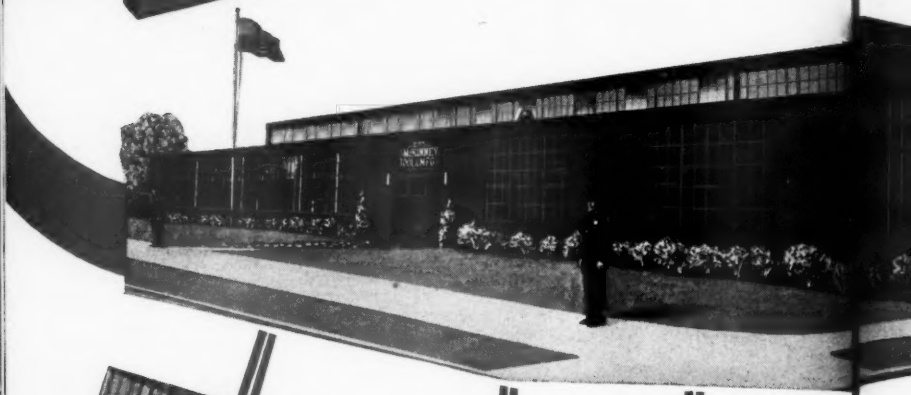

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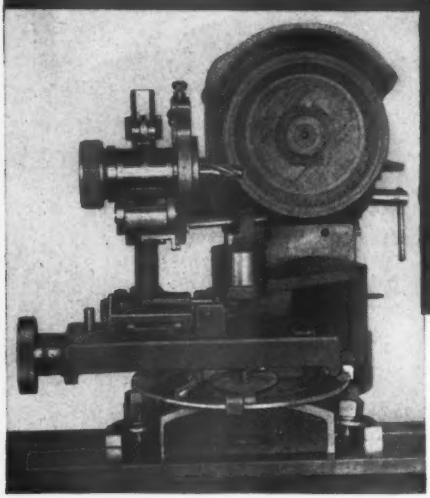

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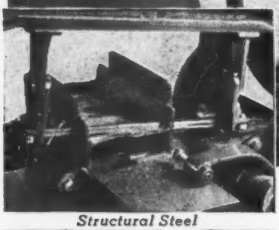

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Round Tubing

Sawing Tool Steel

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ROUNDS: . . . 8" diameter
MOTOR: ½ H. P. current optional
SPEEDS: Selective 60, 90, 130 feet per minute
WEIGHT: Approximately 750 lbs.

• A Wells is a handy tool to have around where there are miscellaneous sawing requirements. In the first place it will cut most any metal of any shape you can get into the saw—and it is simple to move about on casters or a dolly. It cuts accurately and efficiently . . . is economical to operate and costs little to buy. Of course, a Wells is a handy production saw too, for steady, continuous work—but it is such a capable all-around cut-off tool that most any plant can use one to advantage. Ask your Supply distributor or write us for complete details.

Wells Saws

Wells

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WELLS MANUFACTURING CORPORATION
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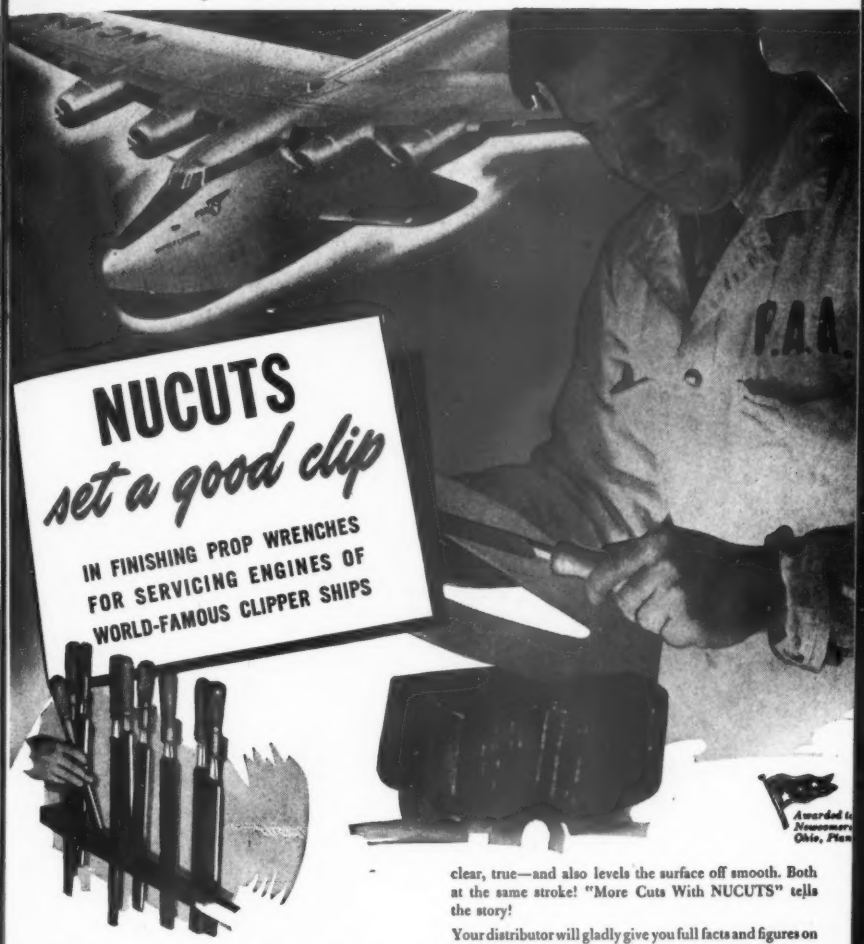

IF YOU were to ask this Pan American mechanic what that device is on which he is working, he'd tell you it is a prop wrench. Or, as it is sometimes called, a persuader bar. An important piece of equipment for loosening the propeller blades of the huge engines that power P. A. A.'s world-famous Clipper Ships!

It is interesting to note that a NUCUT "Wavy Tooth" File is used in finishing the prop wrench to its final dimensions. Interesting,—but not unexpected! For, when it comes to cutting, shaping or finishing parts to dimensions quickly, a NUCUT File is the wise choice. Because of its patented combination of coarse teeth and fine teeth, precisely positioned in "wavy rows", a NUCUT cuts clean, clear, true—and also levels the surface off smooth. Both at the same stroke! "More Cuts With NUCUTS" tells the story!

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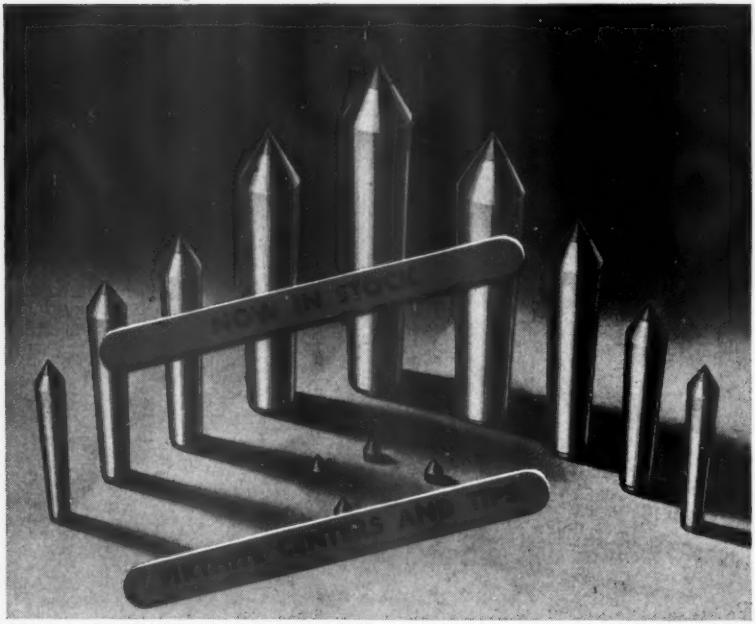

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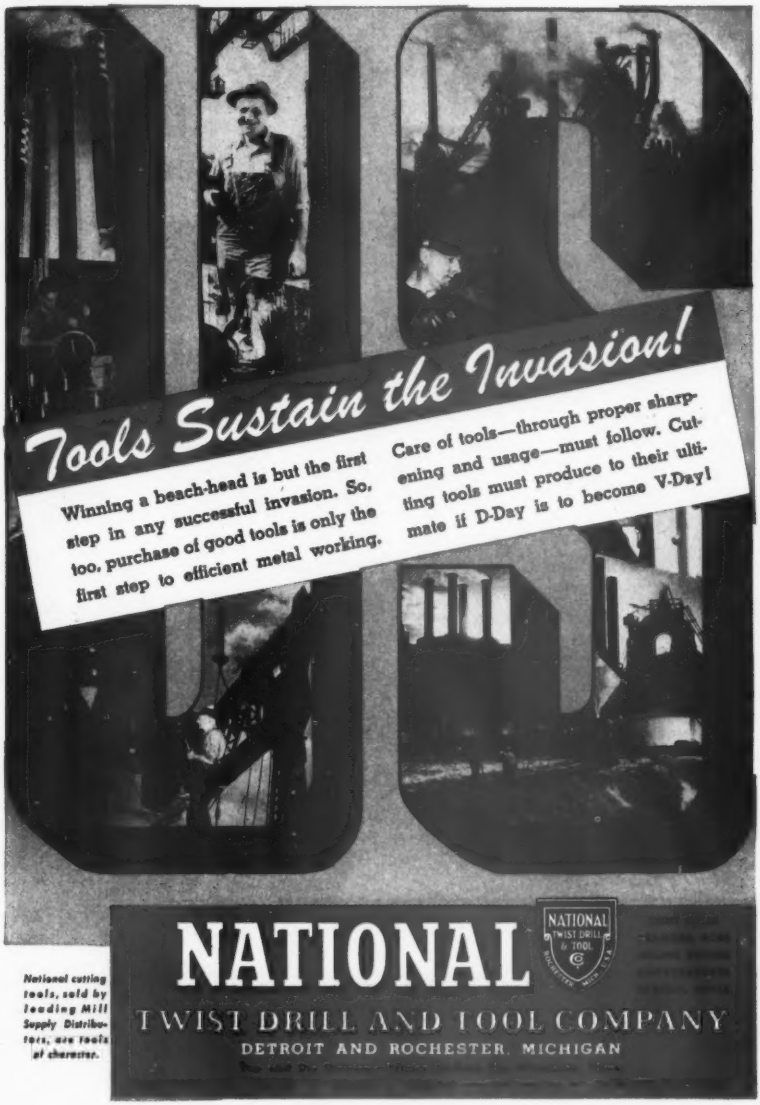
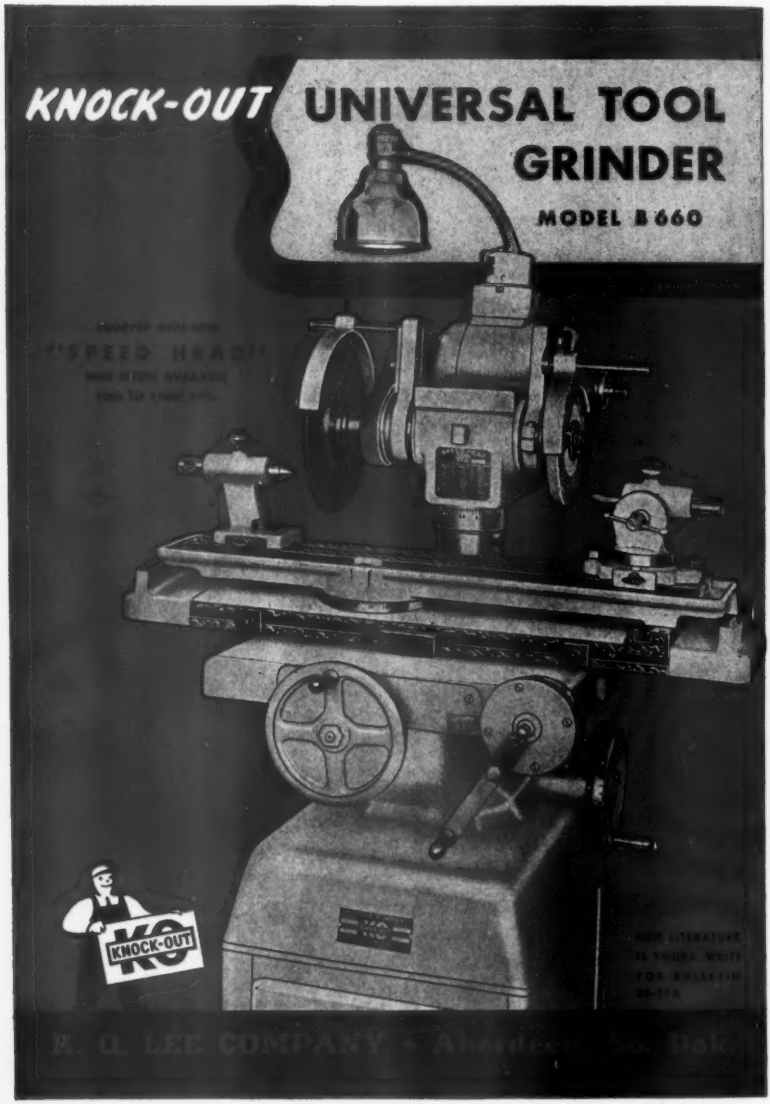
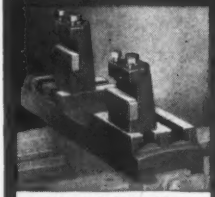
STEEL COMPANY

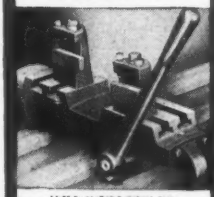
OFFICES: McKEESPORT, PA. NEW YORK HARTFORD LOS ANGELES CLEVELAND CHICAGO PHILADELPHIA PITTSBURGH DAYTON DETROIT


Tools Sustain the Invasion!
Winning a beach-head is but the first step in any successful invasion. So, too, purchase of good tools is only the first step to efficient metal working.
Care of tools—through proper sharpening and usage—must follow. Cutting tools must produce to their ultimate if D-Day is to become V-Day!
NATIONAL
NATIONAL TWIST DRILL & TOOL CO. ROCHESTER, MICH. U.S.A.
TWIST DRILL AND TOOL COMPANY
DETROIT AND ROCHESTER, MICHIGAN
National cutting tools, sold by leading Mill Supply Distributors, are tools of character.


KNOCK-OUT
UNIVERSAL TOOL GRINDER
MODEL B 660
KNOCK-OUT



LA-29 Double Tool Post Cross Slide



LA-25 Double Tool Post Cross Slide

DOUBLE TOOL POST CROSS SLIDES

For use in connection with the Turret Assembly. No. LA-29 is interchangeable with your present Compound Rest. No. LA-25 fits on bed of your present lathe.

With the Logan 6-Position, Self Indexing Turret Assembly, your present Logan Screw Cutting Lathe becomes a *dual* purpose lathe of sustained accuracy, equally dependable for general purpose work, or for high speed production. The Logan Turret Assembly will fit the bed of your screw cutting lathe perfectly, so that tailstock and turret are interchangeable to meet the job in hand. To guarantee accuracy, the Turret Assembly is shipped to you rough bored to 9/16" so that you can finish bore it to 5/8" from your own headstock. Check with your Logan Lathe dealer regarding the advantages and the economy to be gained by equipping your present lathe with the Logan Turret Assembly.

FOR MAXIMUM EFFICIENCY, USE THESE STANDARD LOGAN TURRET LATHES

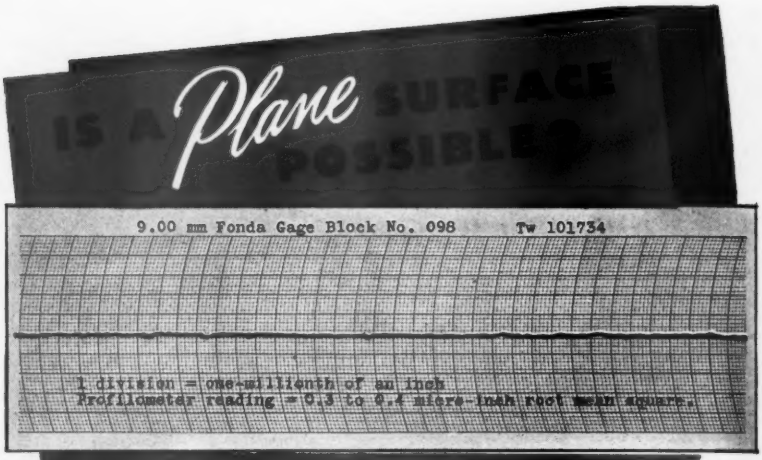
No. 830 Hand Screw Machine

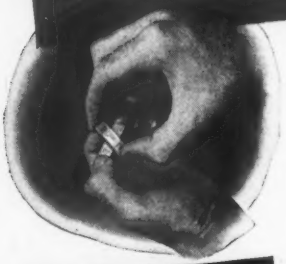
No. 840 Quick Change Gear Turret Lathe

No. 850 Manufacturing Turret Lathe

CHICAGO 30, ILLINOIS

A NAME TO REMEMBER WHEN YOU THINK OF LATHES


IS A Plane SURFACE POSSIBLE?
9.00 mm Fonda Gage Block No. 098 Tw 101734
1 division = one-millionth of an inch
Profilometer reading = 0.3 to 0.4 micro-inch root mean square



Can it stay true?

• Wring together FONDA gage blocks. *No oil or other film is necessary!* See how easily they wring . . . and how strongly they adhere.

The reason? Simply that the "ULTRA-FINISH" — a process exclusive with FONDA — has imparted to the gaging surfaces a smooth flatness (without appreciable peaks), which constitutes the nearest approach to a perfectly plane surface found hitherto in gage blocks.

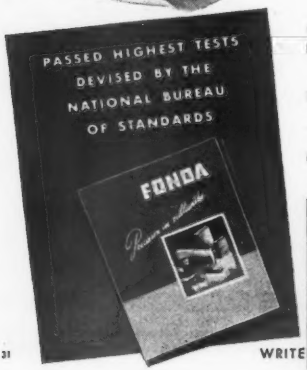
No peaks to wear off and change the block size . . . no films to change over-all dimensions of the wrung blocks . . .

And — a FONDA-developed new STABILIZING process which eliminates growth or shrinkage (at 68°F.), during the entire period of gage block service!

It can be seen why FONDA gage blocks are specified in plants and laboratories where "fine-precision measurement" means just that.

Prompt Deliveries

FONDA GAGE COMPANY • STAMFORD, CONNECTICUT



FONDA Gage Blocks
ALSO FONDA PRECISION GAGES:
Dial, Plug, Ring, Snap, Profile, Flush Pin,
etcetera . . . all types except Thread Gages

31 WRITE

REXALLOY

STANDARD TOOL BITS • STANDARD TIPPED TOOLS • SPECIAL TOOLS TIPPED AND SOLID • CASTINGS

SOME OF THE HUNDREDS OF REXALLOY STANDARD TOOL BITS AVAILABLE

Crucible Steel Co. of America
405 Lexington Ave., N. Y. 17, N. Y.

☐ Please mail me your new 28-page book, *"REXALLOY CUTTING TOOLS"*.

☐ We would like to discuss the possible use of REXALLOY in our plant.

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Firm _____

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CRUCIBLE STEEL COMPANY of America

"FULL-RANGE" QUALITY STEELS for INDUSTRY

HIGH SPEED • TOOL • STAINLESS • ALLOY
MACHINERY • SPECIAL PURPOSE STEELS

TD-11

"Tailored to the Job-"
FOR 100 LBS. POWER MOVEMENT
...OR 50,000 LBS. POWER MOVEMENT
FOR EFFICIENT POWER MOVEMENT IN ANY DIRECTION
T-J

Big or little jobs for "mechanical muscle"...are handled with TOP speed and efficiency by T-J Air and Hydraulic Cylinders!

They're ruggedly built to "take it"...with bodies honed to accurate concentricity and straightness...all mounting surfaces strictly inspected for squareness and smoothness...one piece piston construction for greater dependability.

T-J AIR CYLINDERS exert power movement from 100 lbs. to 12,000 lbs. (direct). T-J HYDRAULIC CYLINDERS exert power movement from 1000 lbs. to 50,000 lbs. (direct). Available in sizes, styles and strokes to meet your requirements. Precision-manufactured and expertly engineered with T-J's quarter century experience. Write for latest catalogs. The Tomkins-Johnson Co., Jackson, Mich.

FOR TOUGH JOBS SPECIFY T-J

TOMKINS-JOHNSON

AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHERS

ABRASIVE No. M-34
VERTICAL SPINDLE GRINDER
MOTORIZED SPINDLE FOR MORE POWER AT THE CUTTING POINT
NEW Abrasive M34 grinder packs five h.p. within its motorized spindle—ample power for every production need. Design minimizes vibration, eliminates gearing and belting and permits heavy cuts with a good finish. Engineered and built to Abrasive's high standards. Many new features. For complete information, send for bulletin.
Available for immediate delivery
ABRASIVE
No. M34
ABRASIVE
ACCURACY BOOSTS PRODUCTION

ABRASIVE MACHINE TOOL COMPANY • EAST PROVIDENCE 14, RHODE ISLAND

TRADE-IN

YOUR OLD DEARBORN GAGE BLOCK SET

YOU can now turn in your used Dearborn Gage Block sets for reconditioning, and we will send you a brand-new set of Dearborn blocks (rectangular) and allow you a 20% discount on the new set. Yes, these Dearborn sets will be new, not reconditioned, and they will all have the **exclusive Ellstrom feature of Chromium Plated Gaging surfaces that insure longer wearing millionths.**

On all other makes of gage block sets we will allow a 10% discount on a new Dearborn set when you turn in these used sets for reconditioning.

In addition to the discounts allowed, we allow you to hold your old set until we deliver your new Dearborn set.

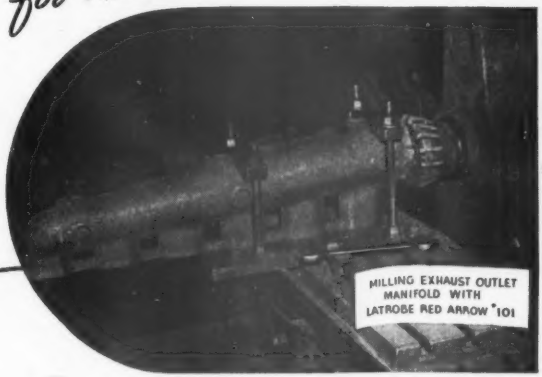
Write today for prices and delivery.

DEARBORN GAGE CO. 22035 BEECH STREET DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks

Have you tried LATROBE RED ARROW

—the Superior Cast Alloy for Metal Cutting Tools



Requires no heat treatment
Easily brazed to tool body
Ground with ordinary wheels

LATROBE RED ARROW Cast Alloy Cutting Tools operate most efficiently in that "intermediate cutting range" between high speed steel and tungsten carbide. Cutting tools cast from these alloys make important savings possible—***more pieces per grind, higher speeds and feeds, better surface finish!***

Standard sizes of Tool Bits carried in warehouse stocks.

MANUFACTURERS OF SMALL TOOLS

Latrobe Red Arrow is available in the "as cast" state for grinding to the dimensions of the finished tool.

6

Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES and PLANT · LATROBE · PENNSYLVANIA

Chip Breaker Wheels Now Available

Their performance is outstanding:

"Grinds 20,000 chip breakers compared with 1200 to 1500 with resinoid diamond wheels."

"Lasts four times as long as the best resinoid bonded diamond wheel."

"Cutting faster than resinoid."

IN STOCK: 4" and 6" diameters, ¼" thick, ⅝" and 1¼" holes; D150-P100V; ⅛" diamond depth.

ORDER TODAY to give your own tool room the advantages of this outstanding development (patented) of the Norton Research Laboratories.

Large scale production of the popular 6 x ⅝" cup and other sizes of Norton Vitrified Diamond Wheels will start early in 1945.

Norton Company
Worcester 6, Mass.

W-981B

SPEED UP RECONVERSION

with

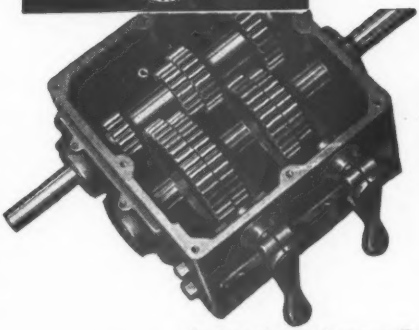
TURNER UNI-DRIVE
Motorized Machine Tools

1 No belts to shift. Drives to large step of cone at all speeds.

2 Eliminates overhead line and counter shafts.

3 All advantages of geared head, with belt drive smoothness.

Reconversion will call for speed and more speed. Be ready with TURNER UNI-DRIVE. Now helping to bring schedules through on time in hundreds of plants. Cuts costs. Saves time. Eases operators' work. Increases production capacity up to 25% — 100% — 300%. Each unit operates independently of all others—high and low speeds at will. See your dealer or write us.



For turret lathes, shapers, milling machines, lathes, radial drills, boring mills, hobbing machines, Brown & Sharpe and Cleveland Automatic Screw Machines and other tools.

OUTSTANDING PERFORMANCE FOR THESE TYPICAL USERS

Aircraft Accessories Corp.
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Kohler Corporation
Monsanto Chemical Co.
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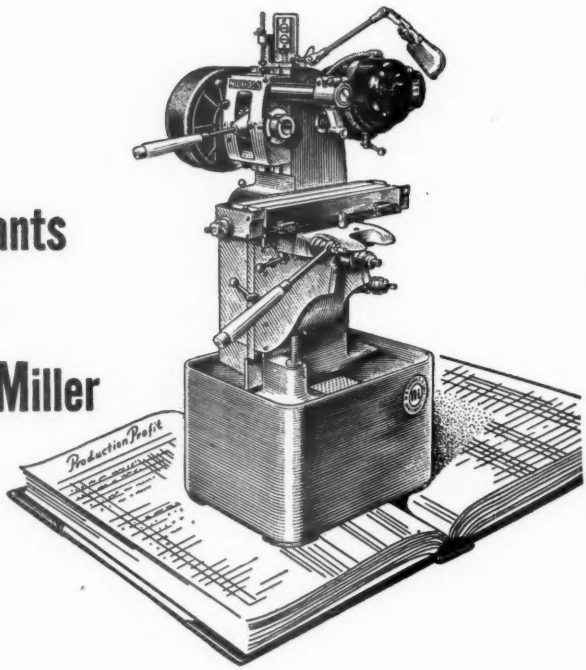
NOW AT WORK FOR VICTORY ★★★

The TURNER UNI-DRIVE COMPANY
(Sales Division: Turner Machinery Co.)
3416 Terrace St. Kansas City 8, Mo.

PRODUCING MACHINE TOOL DRIVES • ORDNANCE TOOLS • AIRCRAFT FITTINGS

Why Accountants Like the Nichols Miller



He may not know a milling machine from a centerless grinder. But your accountant, because he keeps a watchful eye on the profit side of your production ledger, can appreciate the advantages of a machine that *quickly pays for itself*...the Nichols Miller.

Extra-utility is basic in the Nichols Miller's design. Starting with the fundamental principle of bringing the cutter on a sliding head down to the work, W. H. Nichols & Sons has engineered around it a machine tool that maintains *toolroom tolerances* in high-speed production, yet is sturdy enough to take on heavy duty jobs as well.

Simple, inexpensive fixtures and quick set-up keep Nichols Millers humming even in semi-skilled hands, through an extensive range of milling, boring, turning and facing operations.

Lathe carriage flexibility is an added production feature made possible by the Lever-Rack and Pinion Transverse feed, an exclusive Nichols development.

Equally at home in toolroom, laboratory or on the production line, the Nichols Miller is a profitable "operator." And you'll be surprised at its low initial and maintenance costs.

Our new photographic brochure will show you some of the many ways it can work for you. Write for it today.

THE NICHOLS MILLER (ni)

"THE MILLER THAT USES ITS HEAD" • MFD. BY W. H. NICHOLS & SONS, WALTHAM, MASS.

NAT'L DISTRIBUTORS: NICHOLS-MORRIS CORP. • 44 CHURCH ST., NEW YORK 7 • *Dealers in all principal cities*

FOR ACCURACY TO .0001"...

SpeediChuk
WITH THE Precision **BREN COLLET**

Increases 1/2" Collet Capacity Lathes to 3/4"

- **Fits ATLAS, LOGAN, SOUTH BEND, CLAUSING Lathes and others with a 1½" x 8 Thread Spindle Nose having a No. 3 Morse Taper on inside**

List Price
SPEEDICHUK
$19.75
BREN Collets
Round $4.50
Sq. & Hex. $7.50

Accuracy to .0001" is possible with SPEEDICHUK because of its unique floating closing ring and the BREN Collet, whose body taper conforms with the taper of the lathe spindle.

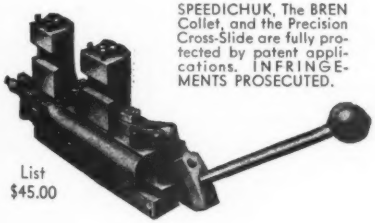
Centering to desired accuracy may be attained by tapping work, and indicating. SPEEDICHUK is ideal for tool room use or short production runs where speed in opening and closing on work is not essential. It requires no adapter plate and is easily fitted to the lathe.

IMMEDIATE DELIVERY FROM STOCK

..AND FOR PRODUCTION CUT-OFF WORK, FORMING, ETC.

THE NEW Precision LEVER TYPE **CROSS-SLIDE**

- **Equipped with sensational tool leveling adjustment — Maintains tool in absolutely horizontal position.**



SPEEDICHUK, The BREN Collet, and the Precision Cross-Slide are fully protected by patent applications. INFRINGEMENTS PROSECUTED.

List
$45.00

A sturdily constructed job, this Cross-Slide has no rack and pinion to become clogged with chips. Handle adjustable in three positions for convenience of operator. Has a five inch travel.

Three models fitting Atlas, Logan, 9" South Bend; can be adapted to most other bench lathes.

- Order from your dealer or write us for literature.

GENERAL DIE-STAMPING-TOOL COMPANY
Precision Collet Division, 262-272 Mott St., New York 12, N. Y.

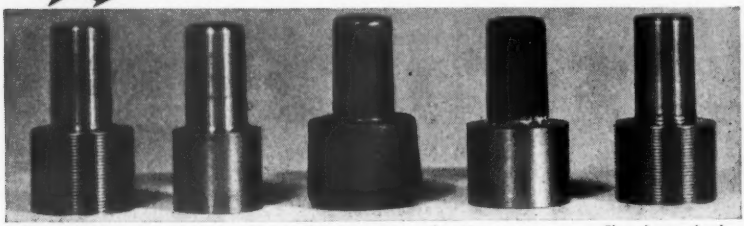
Precision product

GRIFFIN PROCESS
welds
20 TIMES MORE WEAR RESISTANCE
onto new or old thread gages!

GRIFFIN PROCESS welds a solid, tough, wear-resistant layer of fine-grained chromium carbide alloy to the surface of your worn gages after old threads are removed. Threads are then reground to size in the solid carbide, salvaging the old gage and producing a new gage *with an average of 20 times more life!* Equal results are obtained using the Griffin Process for manufacturing new gages.

SIZES: GRIFFIN PROCESS can now be applied to all thread plug gages from ⅜" up, and on thread ring gages from 1" up.

HERE IS THE GRIFFIN PROCESS...



Your worn gage as it comes to us. | Your worn gage with threads removed. | Your worn gage with chrome carbide alloy welded on. | Your worn gage ready for thread grinding. | Threads ground and diamond-lapped to exact dimension.

GRIFFIN PROCESS is ECONOMICAL

RECORDS show a minimum of 15 times more service at an approximate cost of only three ordinary tool steel gages. Griffin Processed gages have been reported to deliver up to 60 times more life than tool steel gages. Actual life increase varies, depending upon material being gaged.

Guaranteed workmanship—prompt deliveries—send your old gages for quotation. Folder mailed on request.

GEORGE O. GRIFFIN COMPANY

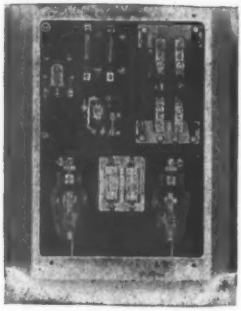
1301 WEST HADLEY STREET • WHITTIER, CALIFORNIA

Chrome Carbide Thread Gages

ACTION — Positive
POWER — Dependable

for POLISHING . . . BURRING OR LAPPING . . .

RELAY PANEL AND RECTIFIER BUILT INTO PEDESTAL BASE



The Lima Magnetic Polishing Lathe offers Positive Action, with Dependable Power for Polishing, Burring or Lapping ferrous metal parts or sections which cannot be held in a conventional chuck or collet, or where holding marks cannot be tolerated.

The four cycle operation of this lathe; Magnetizing, Starting, Stopping and Demagnetizing is obtained through the LIMA developed relay circuit and "step-release" foot pedal control. The dependable power supply of DC current for operation of the magnetic chuck is obtained from the LIMA built, full wave type rectifier unit. This compact relay control panel and rectifier unit is shown in the above illustration and is built into the pedestal of the Lathe, making it a completely self-contained unit. All parts used in constructing the relay system and rectifier unit are standard, and have been selected only after exhaustive tests, to insure the best possible performance and long life.

Lima Magnetic Polishing Lathes will hold pieces or parts from ⅛" diameter up. Interchangeable face plates and register plugs make it extremely flexible in that many different sizes and shapes of work can be handled on one size chuck, simply by changing the face plate and register plug. It requires only a few moments of time to make this change.

Many features which speed up handling time in Polishing, Burring or Lapping operations are built into the Lima Magnetic Polishing Lathe. An engineering bulletin describing the operation and application of this lathe is available. Wire or write today for your copy.

Manufactured by

The **LIMA ELECTRIC MOTOR** *Company*

896 Findlay Road

LIMA, OHIO, U. S. A.

MAGNETIC POLISHING LATHES · GEARSHIFT DRIVES · PEDESTAL GRINDERS · ELECTRIC MOTORS

Get uniform radius on every tooth *this easy way*

TO MAKE every tooth on carbide milling cutters and reamers carry an equal share of the load, each tip must be ground to uniform radius—a job that's easy to do with DI-MET Diamond Wheels. Here's why: DI-MET'S ability to hold wheel size eliminates the need for individually checking each tooth during grinding operations. All teeth are automatically brought to uniform size on the last pass without individually indicating each and without constant machine adjustment, because wheel wear between consecutive passes is undetectable.

Extremely slow rate of wear is only one of the many DI-MET Diamond Wheel advantages for grinding carbides. In addition, high accuracy is obtainable from end to end on carbide cylindrical and surface grinding jobs. DI-MET wheels cut many times faster than vitrified wheels—produce smoother surfaces and much keener edges, which lengthen tool life. Rim speeds are practically constant throughout long wheel life.

Write for DI-MET'S catalog furnishing complete information on sizes, types and prices—sent free on request.

FELKER MANUFACTURING CO.
1111 BORDER AVE., TORRANCE, CALIFORNIA

MANUFACTURERS OF DIAMOND ABRASIVE WHEELS

Multi-Section Hole Grinding in One Simple Set-up

Looking at this 10 station progressive die with 100 holes to be located and ground to .0002" tolerance in the die and stripper inserts, you'd hardly call this a single set-up job. But that's what it is on the Moore Jig Grinder.

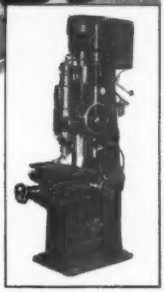
For on this unique machine *all the sections can be screwed and doweled into place, strapped on the table and ground in one set-up*...eliminating separate section hole grinding and the accompanying difficulty of accurately locating each section in the die bed.

Hardening distortion is quickly and accurately corrected. The Jig Grinder relocates holes, finish-grinds them—straight or tapered, within .0001"—removes the decarburized surface and produces a smoother finish. All this in *one-third* the time required by previous, more costly methods. And more uniform clearance between punch and die adds from 25% to 100% to the life of a Moore jig-ground die.

You'll want to know more about what this machine can do for you, why it is considered a toolmaker's "must," how the Moore Jig Grinder put die-making on an interchangeable parts and assembly basis. So why not write today for our technical bulletin.

MOORE SPECIAL TOOL CO., INC.
736 UNION AVENUE, BRIDGEPORT 7, CONN.

MOORE TOOLS

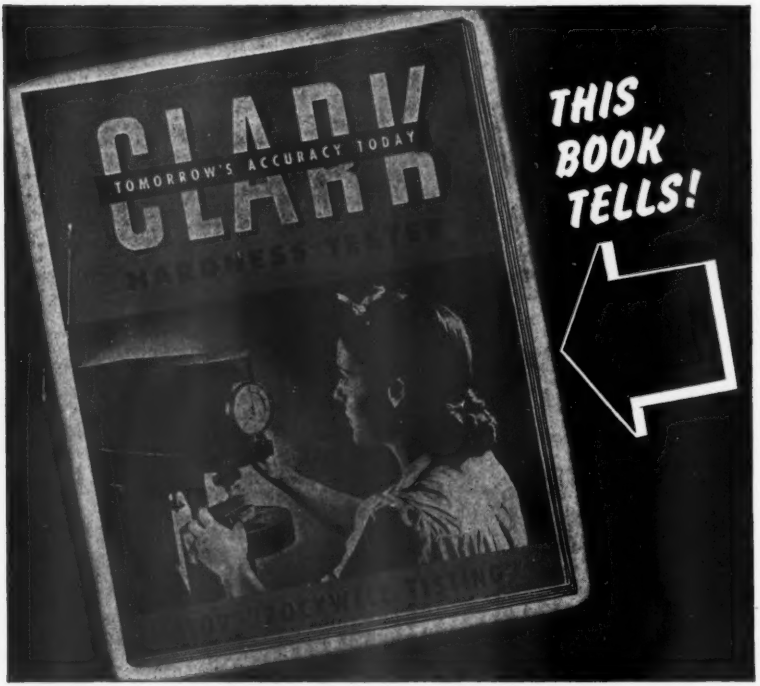


MOORE Jig Grinder

THE ONLY MACHINE OF ITS KIND

DO YOU KNOW THE TRUTH

About Hardness Testing?



CLARK
TOMORROW'S ACCURACY TODAY
HARDNESS TESTER

The new Clark catalog is more than a catalog.

It is a 20-page reference manual on the history, theory, practice, and equipment for modern, scientific hardness testing. Printed in two colors, 8½" x 11", it is available without charge to manufacturing executives. Just drop a line on your letterhead to Department TD, CLARK INSTRUMENT INC., 10200 Ford Road, Dearborn, Mich.

ANGLES

To a minute in a minute

with a BEMISINE

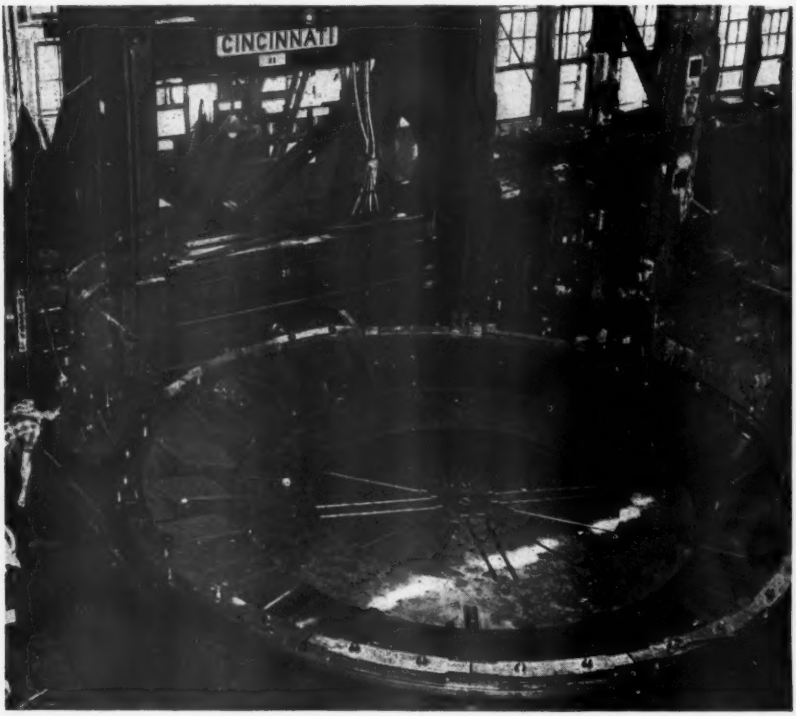
● The Bemisine speeds up and simplifies setting any angle from 0 to 90°—using only a 2" Micrometer*! It holds the work! Faster than a Sine Bar or Protractor! A Jig Eliminator on Surface Grinders and Jig Borers!

*Also used with standard gage blocks.

SEND FOR Bulletin describing this new solution for an old Problem!

NICHOLS-MORRIS CORPORATION
50 CHURCH STREET NEW YORK 7 N Y

Cincinnati Extension Boring Mill Accurately Turning a Big Job



• You may never need a Cincinnati Boring Mill as large as the one above with a swing of 10′ 6″ to 20′ 4″. But no matter which size Hypro you buy you will be assured the same accuracy that the Joshua Hendy Co. of Sunnyvale, Cal. experienced with their Cincinnati Boring and Turning Mill.

• Sixteen bars are being machined on the 17′ auxiliary table with high speed tools. Write for Bulletin 175-T.

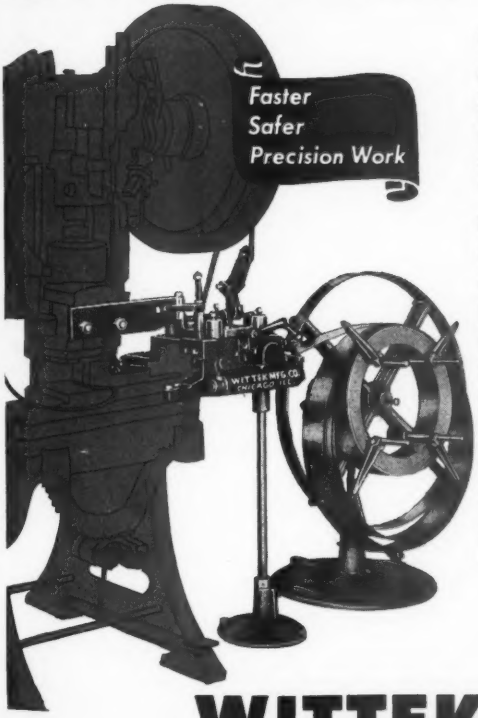
PLANERS · PLANER MILLERS · BORING MILLS

THE CINCINNATI PLANER CO.

CINCINNATI, OHIO

Planning Peacetime Production Using Coiled Strip Stock?

Equip with
WITTEK
Automatic Roll Feeds and Reel Stands



Wittek Roll Feeds are being used extensively by war plants in their large volume production of high quality metal stampings. The flexibility of Wittek Roll Feeds will assist these plants in their peacetime conversion through their adaptability to various jobs. Keen competition will demand the utilization of equipment to its point of highest efficiency. If your postwar plans include punch press production of parts from coiled strip stock—investigate now the many possibilities of Wittek Roll Feeds and Reel Stands.

Write for catalog, prices and recommendations

WITTEK
MANUFACTURING CO.
4305-15 W. 24th Place, Chicago 23, Ill.

Automatic
ROLL FEEDS
AND
REEL STANDS

BUSHINGS

XLO Precision XLO Precision XL
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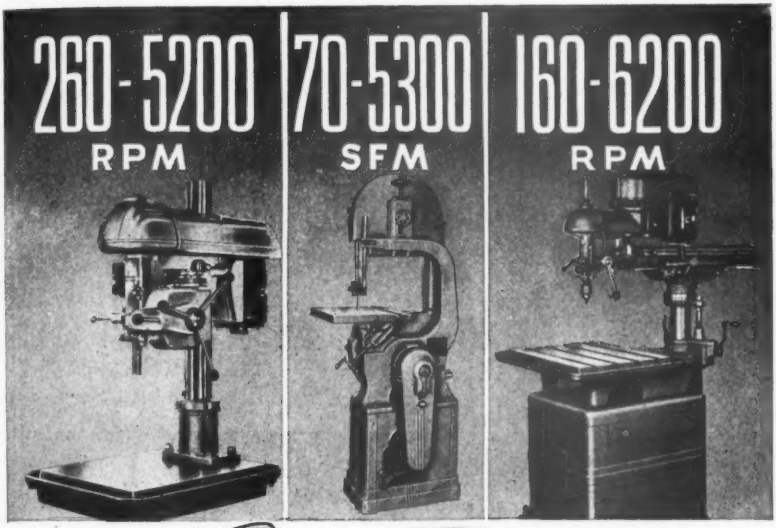
Big or small . . . long or short . . . head or headless press fit . . . fixed or slip renewable—chances are Ex-Cell-O's Bulletin 11882 will list the drill jig bushings you need. Send for your copy.

XLO

EX-CELL-O *for* PRECISION

EX-CELL-O CORPORATION

DETROIT 6 MICHIGAN



GET THE *Correct* CUTTING SPEED WITH WALKER-TURNER MACHINE TOOLS!

Every material — every operation — has its proper speed . . . the speed at which machining is done most accurately, most economically, most efficiently.

Walker-Turner Machine Tools — because of their exceptionally wide ranges of cutting speeds — enable production men to hit the correct speed "on the button"! This gives Walker-Turner Machine Tools versatility for handling all materials in all types of operations . . . from every-day production to complicated, special tooling set-ups. These qualities may prove the answer to your own problems. Write for our catalog today!

WALKER-TURNER CO., Inc., Plainfield, N. J.

Walker-Turner
Machine Tools Offer These Advantages:

- Versatility
- Rugged construction
- Safe, simplified operation
- Low power consumption
- Low capital investment
- Low operating and maintenance cost

RADIAL DRILL — Drills to center of 62" circle. Head tilts 45° right or left. Maximum distance nose of chuck to table, 13½". Spindle traverse, 3¾". Chuck capacity, ½".

METAL-CUTTING BAND SAW — 14" and 16" models. Geared speed reducer. Table tilts to 45° and has mitre gauge groove. Blade tensioning device has spring cushions to absorb shocks.

20-INCH DRILL PRESS — Hand or power feed. Bench or floor, single or multi-spindle models. Drills to center of 20" circle. Feed 6". Capacity 1" in cast iron, ¾" in steel.

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COMPANY, INC.
PLAINFIELD, N.J.
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MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

Heat Treat Your Own Small Parts...

SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

1. Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
2. Saves time and expense of drawing or tempering small metal parts in large furnaces.
3. Cuts handling time when normalizing or annealing small parts. No waiting.
4. Conveniently available for pre-heating for subsequent high-speed hardening.
5. Eliminates shut downs and delays in servicing emergency repair orders.

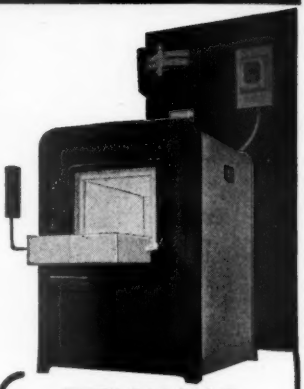
AVAILABLE IN TWO SIZES

Type	*Chamber Capacity*	*Amps 115 V*	*Watts*	*Amps 230 V*	*Price*
MH-3	8″W 6″H 14″L	29.6	3400	14.8	$124.00*
MH-4	10″W 6″H 18″L	....	4800	20.9	$191.00*

**Includes Hearth Plate*

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—$152.40.

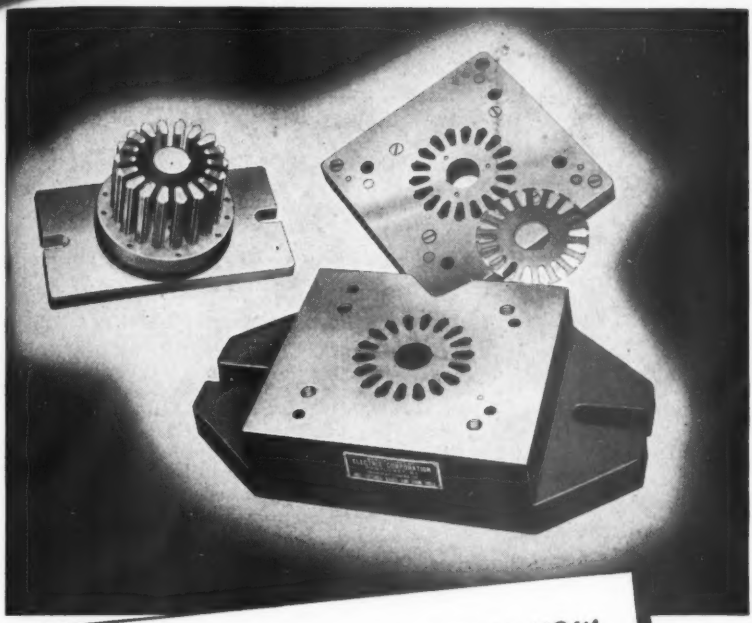


REPLACEABLE HEATING ELEMENTS

Replaceable nickel chromium resistors embedded in rectangular refractory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel — furnace structure remains undisturbed.

FREE—Complete data covering specifications, additional applications and ordering instructions are included in this new folder. Write for your copy today. Ask for Bulletin No. 50.

COOLEY ELECTRIC MANUFACTURING CORP.
32 SOUTH SHELBY STREET • INDIANAPOLIS 7, IND.



LAMINATION DIES . . . *we can now make* MORE *of them* . . . FASTER!

The demand for lamination dies is so great, the number of tool shops who can make them is so small, that we have expanded our Lamination Die department for both greater volume and quicker deliveries.

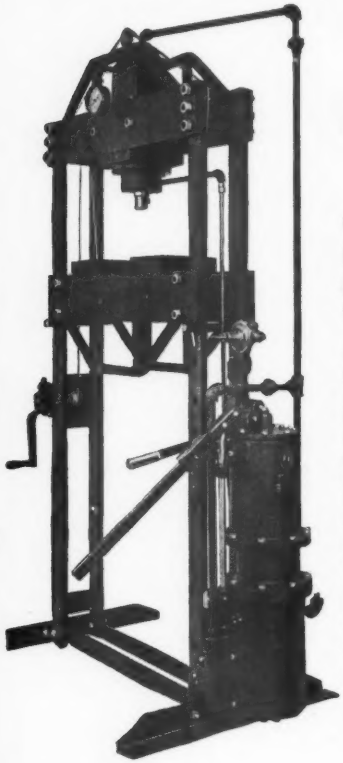
For estimates on the lamination dies you need, please submit detailed blueprints, including layout of dies. Your inquiry will have our immediate attention; the work we do for you will have our best efforts at all times for precision and quality.

GO — PRECISION — AUTHENTICATORS — NO-GO

Peacetime engineers of soft-rubber connectors for electrically-operated equipment, sold exclusively through U. S. RUBBER CO.

ELECTRIX *Corporation*

156 MIDDLE STREET • PAWTUCKET, R. I.

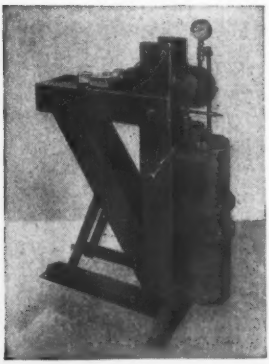


HIGH OUTPUT *Low Cost*
KRW PRESSES
Quickly solve "TIGHT SPOT" *production problems*

VERSATILE KRW HYDRAULIC PRESSES . . . EQUIPPED WITH PATENTED KRW SPEEDI-BOOSTER . . . USING INEXPENSIVE DIES, DO THE WORK OF HEAVIER HIGH-COST PRESSES

● Like the motto of our famous Seabees, KRW Presses answer "Can Do" to innumerable production problems. A look at some of the jobs that these presses have handled in the heat of trebled and quadrupled production, and the answers are hard to believe. In a great many cases, they have taken over the work of expensive, heavy machines which were unavailable at the time. Heart of the new Speedi-Booster Hydraulic Press is its sensitive fingertip control mechanism which instantly governs ram movement. Using easily made dies, these KRW Presses are adaptable to a great many bending and pressing operations requiring pressures from 5 to 75 tons. The effective hydraulic pressure varies with the air pressure used...which ranges from 80 to 225 pounds. A built-in regulator permits the exact duplication of pressure on every stroke. Available for either horizontal or vertical operation. Write for our descriptive Press Bulletin. We also manufacture suitable air compressors. K. R. Wilson, 10 Lock Street, Buffalo 2, New York.

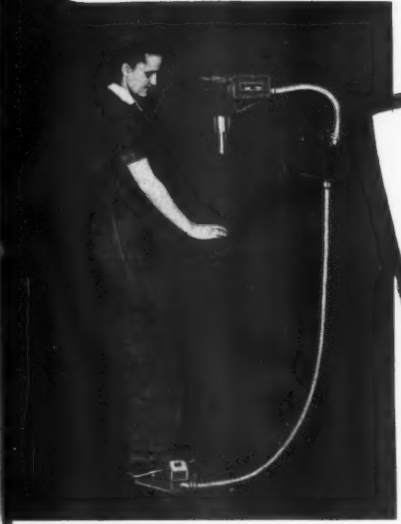
THIS MACHINE...MAKES THIS...WITH THESE SIMPLE DIES



With the simple dies shown, quickly made from stock steel, this 6-inch ring is made with but four feeding passes into the lower die. Before the radius is completed, the shackle is inserted into the die notch, permitting the ring to "thread the eye" of the shackle. Closing ring by welding completes operation. EQUIPMENT: 25-ton KRW Press.

K. R. WILSON
10 LOCK ST., BUFFALO 2, N. Y.

PRECISION TAPPING WITH YOUR DRILL PRESS



ROTOREX

Converts Your Drill To a PRECISION TAPPER

Producing Class 3 Threads By Positive Lead Automatic Cycle

The Rotorex Tapper consists of spindle assembly including nut, lead screw and friction brake. Limit switch for automatically and accurately controlling depth of tapping. Foot switch starts the tapping cycle and provides instantaneous emergency reverse. The convenient foot control leaves the operator's hands continually free to prepare and load work.

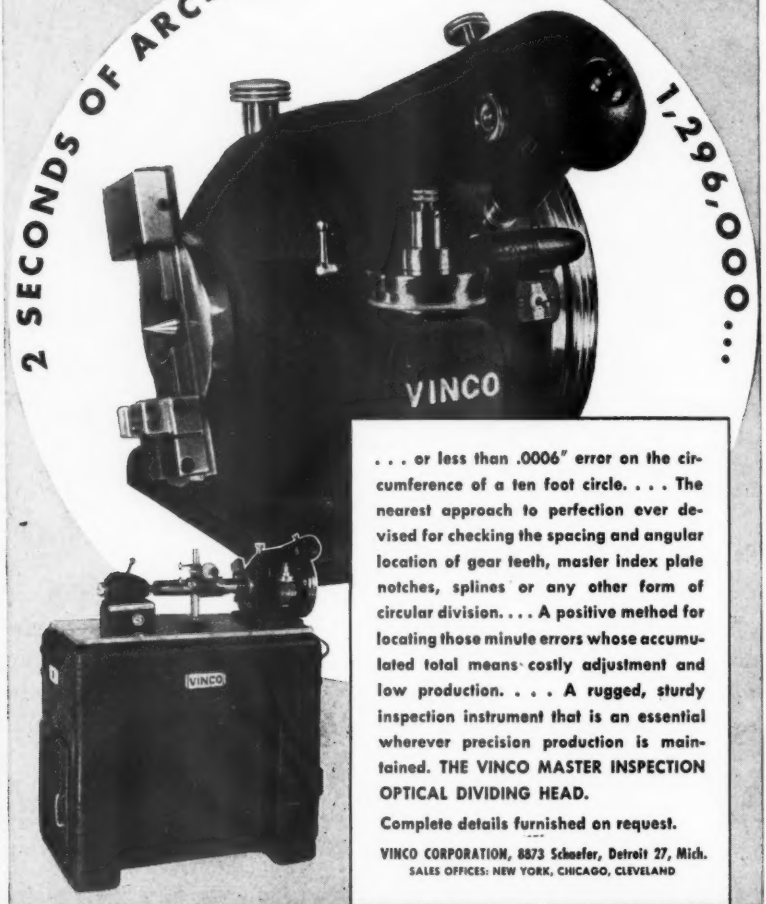
The Rotorex Precision Tapper is available, on an MRO priority, for immediate shipment for use with 14″ and 17″ Delta Drill Presses — the cost $175. F.O.B. Riverside, California. For further information write today for catalog.

5990R

Douglas Machinery Co., Inc.

150 BROADWAY · NEW YORK 7, N. Y.

2 SECONDS OF ARC—TWO PARTS IN 1,296,000...



. . . or less than .0006" error on the circumference of a ten foot circle. . . . The nearest approach to perfection ever devised for checking the spacing and angular location of gear teeth, master index plate notches, splines or any other form of circular division. . . . A positive method for locating those minute errors whose accumulated total means costly adjustment and low production. . . . A rugged, sturdy inspection instrument that is an essential wherever precision production is maintained. THE VINCO MASTER INSPECTION OPTICAL DIVIDING HEAD.

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Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Seming Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development

FOR IMPROVED GRINDING PERFORMANCE

Ask BESLY!

Besly's engineering knowledge of grinding isn't in the books—nor can it ever be! For a knowledge of grinding is built by intimate acquaintance with the day to day shop problems of industrial plants throughout the country.

Besly was the first to provide a successful bolted on abrasive wheel, the resinoid bonded Besly Titan Steelbac. Ever since, this company has specialized in resinoid bonded abrasives and the nationwide preference for wheels of this type for an ever increasing variety of grinding jobs has proved the wisdom of this specialization.

If you want information on longer wheel life, more accurate grinding, better finishing...write or phone us.

BESLY CHICAGO

BESLY GRINDERS AND ACCESSORIES
BESLY TAPS • BESLY TITAN ABRASIVE WHEELS

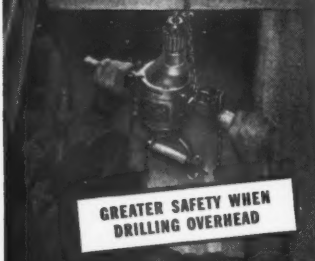
CHARLES H. BESLY AND COMPANY, 118-124 N. Clinton St., Chicago 6, Ill., Factory: Beloit, Wis.

MAKE ANY DRILLING JOB in any position EASIER with this

Pressure Handle

on a

SKILSAW DRILL!



● Now you can drill with *extra ease* and *extra safety* in any position . . . head-high, overhead or on ladders . . . by simply attaching this Pressure Handle to your SKILSAW DRILL *or any make of drill.* Pressure Handle gives the operator complete control of drilling pressure at all times . . . eliminates twist drill breakage . . . saves the time of an extra man with ropes or chains to hold the drill. Fits SKILSAW DRILL Models "64", "80", "82", "83", "101", "103", "121", "123", "141", "143", and all other makes of electric or pneumatic drills of from ⅜ in. to 1 in. capacity in steel.

Sold Nationally Through Skilsaw Distributors for $30

Ask your distributor today for a demonstration of this Pressure Handle on your own work.

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5033-43 Elston Ave., Chicago 30, Ill.
Sales and Service Branches in All Principal Cities

ARMY-NAVY

SKILSAW PORTABLE ELECTRIC TOOLS
MAKE AMERICA'S HANDS MORE PRODUCTIVE

Choose the
Center with the

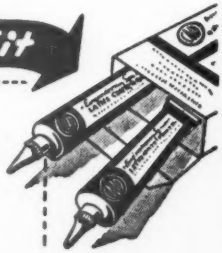
Helical Groove

CMD

Longer running time between replacements

To make machines run longer before requiring attention to centers — choose the center with the helical groove — made only by CMD. The exclusive advanced design, with the left-hand Helical Groove, assures more complete and longer lasting lubrication of point and work. No more burned-out center points! No stopping machine to relubricate center! No readjustments of tail stock! When CMD Helical Groove Centers are lubricated with CMD Center Point Oil, running time is frequently increased as much as 1500 per cent.

Write for* FREE *Sample Kit



CHICAGO MANUFACTURING & DISTRIBUTING CO.
Dept. 11J, 1928 West 46th St., Chicago 9, Ill.
☐Send Circular on CMD Helical Groove Centers without obligation to us. ☐Send FREE sample kit containing a tube of CMD CENTER POINT OIL and a tube of CMD CENTER POINT LUBE (grease) with directions for making an amazing, simple test.

NAME .....

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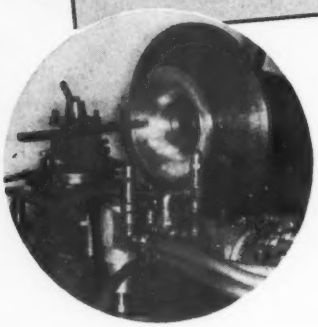
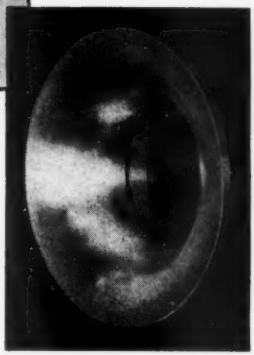
Now YOU CAN USE YOUR LATHES TO CUT VARIABLE CONTOURS!



HERE'S HOW IT'S DONE



With the help of a Turchan Hydraulic Follower, a lathe can now be used to machine many difficult types of contours—such as the curved surface on the magnesium housing illustrated above, which has 3 different radii and tapers.

Making a complete cut every 15 minutes, the Turchan Attachment follows the template so exactly that the housing is finished to a tolerance of .001″ on the outside diameter, and a tolerance of .002″ on the inside diameter. This is a feat in contour machining that is practically impossible by any other known method.

SEND US
Sample or Blueprint of Parts —for Turchan Production Estimate

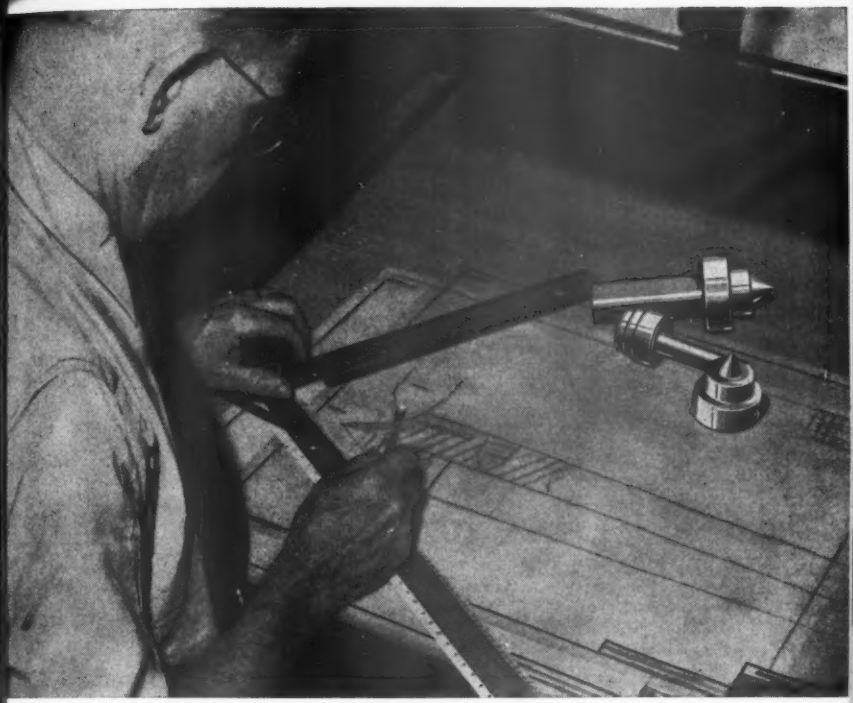
"Turn to Turchan"

If your present or postwar work involves the mass production of a part of irregular or eccentric shape, on lathes, grinders, shapers, planers or boring mills, send us the part or a blueprint for an estimate of the machining time you can save through the use of a Turchan Attachment. This is a regular part of our service. No obligation.

TURCHAN

TURCHAN FOLLOWER MACHINE CO.
8257 Livernois - Detroit 4, Mich.

Hydraulic Follower Machine



ENGINEERED LIVE CENTERS

A properly designed Live Center is one of the fundamentals of setting up a job and requires a specialist's experience. Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action that compensates for expansion due to heat shock and excessive thrust loads—reducing wear to a minimum. Send us your blueprints and specifications—we will see that your job gets set up with the right Live Center. Standard shanks with Morse taper carried in stock.

STURDIMATIC
TOOL COMPANY
5226 THIRD AVE. DETROIT 2, MICH.

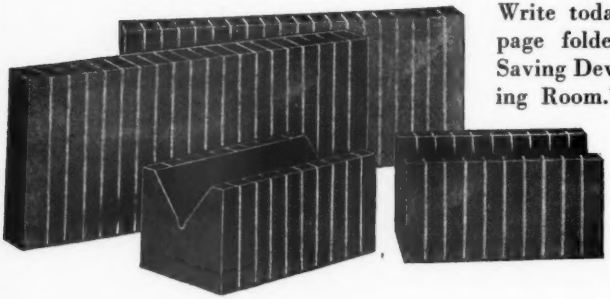
FOR HOLDING GRINDING WORK

Magne-Blox laminated parallels and V-Blocks can be furnished in special sizes and forms to hold various types of work for surface grinding that may now require complicated clamps and holding devices. With Magne-Blox, you simply set the work in place and proceed with the grinding. Investigate!

MAGNE-BLOX SETS FOR IMMEDIATE DELIVERY

Now available for immediate delivery are our standard Magne-Blox Parallels and V-Blocks in the following sizes. They will quickly save their cost by simplifying difficult set-ups.

Set large Magne-Blox Parallels, 1″ x 3″ x 7¾″.....$29.50
Matched double pair of above (4 pieces).....$59.00
Large Magne-V-Blocks, 1¾″ x 2⅜″ x 3¾″.....$26.50



Write today for our new 8-page folder entitled "Time Saving Devices for the Grinding Room." This pamphlet contains information that every grinding room foreman should have.

GEORGE SCHERR CO., INC.
128-B LAFAYETTE ST.
NEW YORK 13, N. Y.

What is DIE-LESS DUPLICATING?

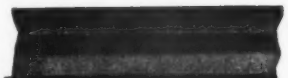
Here is a simple 3-STAGE explanation:

"DIE-LESS DUPLICATING" might be described as a new industrial technique made possible by the accuracy, extreme adaptability and ease of operation of DI-ACRO Precision Machines—Shears, Brakes, Benders —especially when used as a continuous, integrated production process.

←1ST STAGE . . .

Cutting flat material to size and shape for part to be duplicated. The DI-ACRO shear rapidly resizes and squares material, also makes slits, strips, notches, angle cuts, etc. Guides, stops and blade pitch are all quickly adjustable. 3 sizes—shearing widths 6", 9", 13".

SHEARS



←2ND STAGE . . .

Forming angles, channels or "Vees" from sheared flat material. The DI-ACRO Brake forms any angle from 0° to a maximum of 110°. Contact surfaces are adjustable and may be slotted, recessed or altered as needed for the parts required. 3 sizes—folding widths, 6", 13", 18".

BRAKES

←3RD STAGE . . .

Bending sized and formed material to simple, compound or reverse curves of desired radii. The DI-ACRO Bender handles angle, channel, moulding, rod, tubing, wire (round, square, flat), strip stock and other ductile materials in a remarkably wide range of accurate contour forming. 3 sizes—radius capacity 8" 6", 9", handling up to ½" cold rolled steel bar.

BENDERS

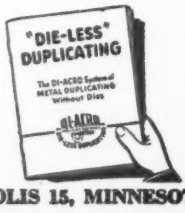
DO YOU HAVE DUPLICATE PARTS TO FORM? . . . .

The DI-ACRO System of METAL DUPLICATING WITHOUT DIES has proven its adaptability in making parts just as accurately as can be done with dies, to a tolerance of .001" in all duplicated work. The delay of waiting for dies is avoided—deliveries speeded up. Changes needed in production can be made simply by adjustment of DI-ACRO Precision Machines, which are also widely used for laboratory and research work, making models, etc. Production work is often done in excess of 1,000 operations per hour, by girls or inexperienced workers.

←— Pronounced "DIE-ACK-RO"

Send for Catalog—
"DIE-LESS" DUPLICATING

It gives full details on all models of DI-ACRO Shears, Brakes, Benders, and many examples of parts made with "DIE-LESS DUPLICATING".



DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

315 EIGHTH AVE. SOUTH **MINNEAPOLIS 15, MINNESOTA**

SHELDON Back Geared Screw Cutting PRECISION LATHES

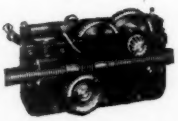
1″ Collet Capacity 11¼″ Swing

The SHELDON 10″ x 1″ series Precision Lathes, combine the advanced features of *extra* collet capacity (1-inch), *extra* swing (11¼ inches), an *efficient* 4 speed, V-belt underneath drive, and a commodious steel cabinet base. The headstock, spindle and spindle bearings are larger and heavier than is standard for 10-inch lathes giving not only increased production capacity but also assuring permanency of this lathe's extreme accuracy. SHELDON 10″ x 1″ Lathes have full quick change gears, a worm feed apron with power cross feed and every other essential feature of a quality machine tool, still are surprisingly low in price. *Write for Catalog.*

Full Double Wall Apron.

Spline Drive.

Double Half Nuts for thread cutting.



Smoothly operating efficient clutch — just a slight turn of wrist between full release and positive drive.

Standard industrial sized controls.

SHELDON MACHINE CO., INC. 4236 N. Knox Ave., Chicago 41, U. S. A.

Universal Collet Chucks Precision-Built to Fit the job

In addition to the four chucks shown here Universal also manufactures Boring Chucks, Mikro-lok Boring Bars, Grippets, Plungers and a complete line of standard drill bushings. Write today for catalogs on all or any one of these precision made products.

Universal Centering Chucks make a centering machine of most any medium size drill press.

Universal Floating Chucks are designed especially for horizontal operation in screw machines and turret lathes.

Universal Standard Collet Chucks have a grip as strong as solid steel itself —are available with tang or plain tapered shank.

Universal Collet Chuck with National Milling Machine Taper Shank.

Fighter Plane
Given by employees

20%

20% Employees
Bond deductions

UNIVERSAL ENGINEERING CO.

FRANKENMUTH, MICHIGAN

SAVE PRODUCTION TIME

with a

SHOPLIFTER

One man can handle heavy dies alone. Not necessary to stop other machines to get help.

MORE production per day from your machines if a Shoplifter is handy to do the heavy job of moving dies from storage racks to the press. In these times when maximum production of machines is of vital importance, much time and labor can be saved if the operator can handle the heavy work of changing dies without calling for help from other operators.

The Shoplifter is built for this job. Dependable and safe with a rated capacity of 500 lbs. (heavier machines up to 5000 lbs. can be furnished). Entire machine built of structural steel. Electrically welded throughout. Steel platform 24" x 24", lifts 54" above floor and lowers to within 4⅞" of floor. Overall height 72". Crank, up and down, hoist unit.

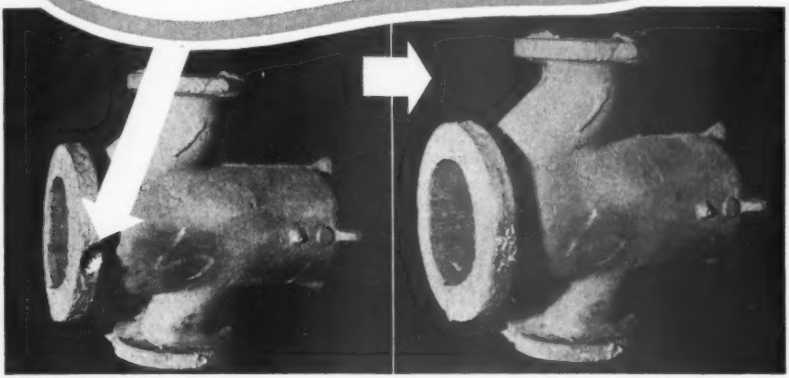
ECONOMY ENGINEERING CO.
2659 W. Van Buren St., Chicago, Ill.

Price **$147.50**

IMMEDIATE DELIVERY

The best way out of this hole is to weld with

PHILLIPS "600" ELECTRODE



5 minutes welding with PHILLIPS "600" Electrode saved this 180-lb. iron casting from the scrap pile.

IT is the work of a very few minutes, and it takes only a few cents' worth of material, to restore this gray iron casting completely. After machining the weld cannot be distinguished from the parent metal, because PHILLIPS "600" deposits are the same color as cast iron. And there is no difficulty about machining, drilling, tapping, etc., because the deposit is fully machinable, *including the line of fusion.*

Consult with Phillips on all cast iron salvage, maintenance and repair problems. There is a correct rod for every application of electric arc welding to cast iron, and Phillips has it. There is also a correct procedure for each of these applications—and Phillips can supply it.

This new manual is a complete guide to the selection of materials and procedures for arc welding cast iron. Send for your copy TODAY.

C. E. PHILLIPS & COMPANY

2750 Poplar Street, Detroit 8, Michigan ● 332 So. Jefferson St., Chicago 6, Illinois

MANUFACTURERS AND DISTRIBUTORS OF WELDING ELECTRODES AND SPECIALTIES

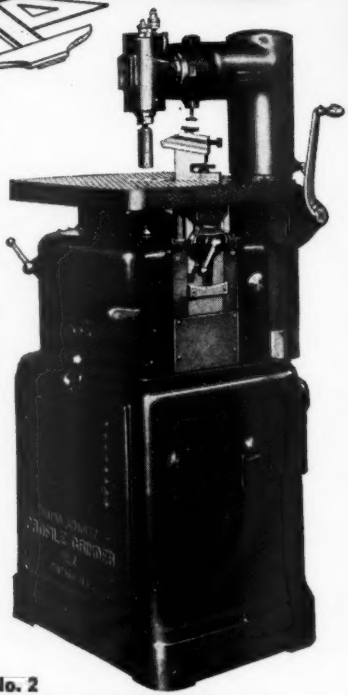
BOYAR-SCHULTZ PROFILE GRINDERS

Vital Tools for Making the Tools of Production . . . . . .

WITH the coming change from "all out" production for war to production for fast growing peace-time needs, machines for making the tools of production are more and more important.

Boyar-Schultz Profile Grinders have long been recognized as vital tools in the tool and die shop. They are built for economically grinding and finishing irregularly curved surfaces and odd shaped contours so frequently encountered in making dies, punches, templates, cams and special machinery.

No. 1
PROFILE GRINDER—a bench size tool operating at 20,000 R.P.M. For grinding and regrinding die clearances, sharpening punches, and economically grinding cams and templates.



No. 2
PROFILE GRINDER—with two independently powered spindles operating at 10,000 R.P.M. with vertical oscillations. Stock is rapidly removed, even with wheels of small diameter.

BOYAR-SCHULTZ CORPORATION
2112 Walnut Street **CHICAGO 12, ILLINOIS**

VARD

Vernier Caliper

A precision measuring tool made by gage makers for machinists, engineers, and skilled mechanics.

This type of caliper is tried and proved over many years. VARD simply took a solid principle and made a better sliding jaw caliper than has been made before. Here are the advantages the VARD Vernier Caliper gives you.

1. It measures a full 6 inches inside or outside diameter between jaws.
2. The clear, engraved (not stamped) graduations read directly in thousandths of an inch on the vernier.
3. A positive action thumb release controls the jaw slide. The slide does not bind.
4. A relieved point depth gage is made integrally with the slide and measures a full 6 inches of depth.
5. The caliper is made of selected tool steel with wearing parts hardened and ground.
6. It fits handily in the pocket.
7. Its range is greater than a "mike" — its accuracy as exact.

Write for literature, price and delivery data.

VARD *stands for* Verity · Accuracy · Responsibility · Durability

VARD INC.
PASADENA 8, CALIF.

UNIFORMITY

Uniformity is an outstanding feature of Chicago "Safety Plus" Socket Screw Products. Each and every piece is alike as two peas in a pod.

Machining on modern precision equipment designed and built to maintain the closest production tolerances, plus inspection after each operation on the latest type automatic gauging devices — adds up to a uniformly accurate product ideally suited for quick and trouble-free assembly . . . On your future requirements specify Chicago "Safety Plus" Products.

These Fine Products are sold only thru Authorized Distributors.

ARMY E NAVY

THE CHICAGO SCREW CO.
1026 So. Homan Avenue · Chicago 24, Ill.

Cut Your **DEEP DRILLING** *Costs!*

DEEP DRILLING *Goes Faster* WITH **OIL-HOLE DRILLS!**

NO *Overheating* **IN DEEP-DRILLING** WITH **OIL-HOLE DRILLS!**

One sure way of reducing deep-drilling costs is to use a drill that enables you to perform the drilling operation faster.

Another sure way of reducing deep-drilling costs is to use a drill that, because of its longer life, effects a saving in tool outlay.

Because our oil-hole drill has a cutting edge that is always cool, it has a life two to three times that of ordinary drills. Please remember this the next time you need drills for deep-drilling.

All sizes from ⅜″ to 3½″ in diameter and up to 36″ overall

DETROIT REAMER & TOOL CO.

2830 E. 7-Mile Road Detroit 12, Mich.

Manufacturers of

Oil-Hole Drills . . . Special Reamers . . .
Circularity Relieved Reamers and End Mills
***Also* Special Tools**

LONG PRODUCTION RUNS— COMPLETE ASSEMBLIES

We can now devote some of our highly specialized facilities to your long run production and assembly operations.

We are equipped to produce special machines, sub-assemblies and tooling—including design, development and manufacturing.

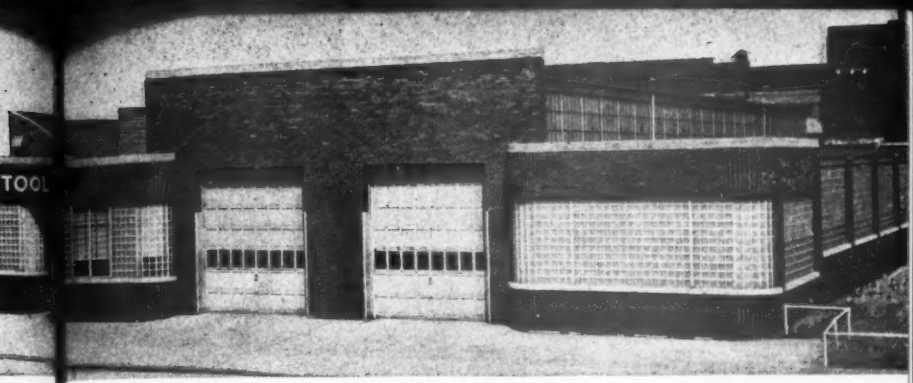
If you are a merchandiser of machine tools, consider the advantages of having them produced by us. From blueprint to finished product, our shop is like an individually-skilled craftsman, equipped to do the job most efficiently, and at the right price.

Our 24 years of experience and successful accomplishment is your assurance of satisfaction. We have the tooling and production know-how to tackle all kinds of jobs — tough or simple.

Write today for folder listing the modern facilities which assure you quality production on a quantity basis. Submission of prints or sketches invited. If it's speed you need, wire or phone us.

THE BUNELL MACHINE & TOOL COMPANY

1601 EAST 23RD STREET • TELEPHONE CHERRY 0343 • CLEVELAND 14, OHIO



Chamber of Commerce award as the best small industrial plant completed in 1941-42.

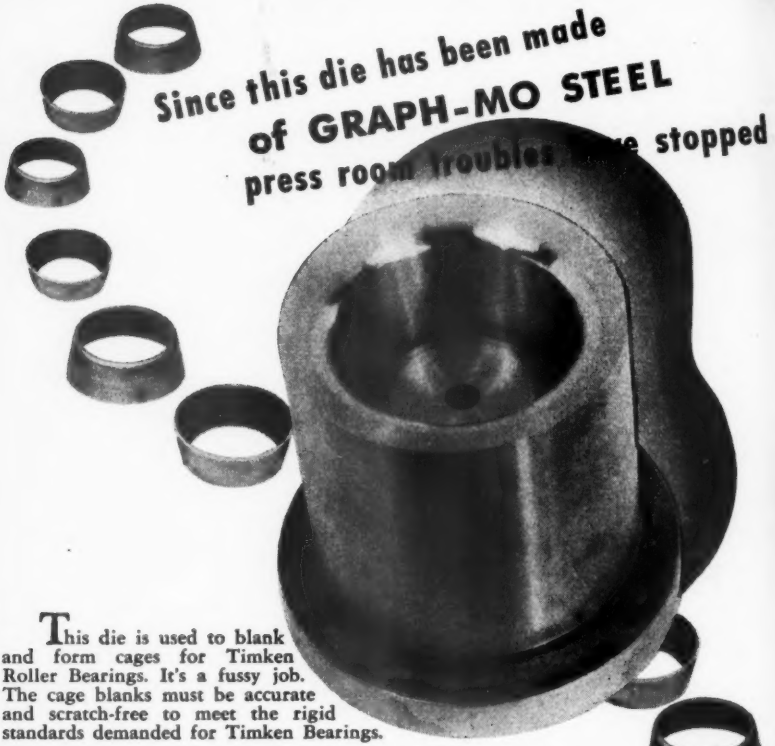
A section of our Engineering Department in which special tools, dies, jigs, fixtures, gages and special machines are designed

DESIGNERS AND MANUFACTURERS OF

Tools • Special Machinery • Dies • Jigs • Gages • Fixtures

PRECISION PRODUCTION OF PARTS AND ASSEMBLIES

Since this die has been made of GRAPH-MO STEEL press room troubles [illegible] stopped



This die is used to blank and form cages for Timken Roller Bearings. It's a fussy job. The cage blanks must be accurate and scratch-free to meet the rigid standards demanded for Timken Bearings.

Many tool steels were tried for this die. The best life provided by any of them was 1,000,000 pieces, and it was necessary to regrind the dies after 50,000 pieces were run. Pick-up, galling, scoring and pitting were also problems when those steels were used.

Since the dies have been made of Graph-Mo Steel, they blank and form 300,000 perfect, scratch-free pieces before they have to be reground, saving six to seven hours per run by eliminating non-productive time required formerly to make frequent die assembly installations. Because 80 cages are blanked and formed every minute, the time saved made production figures soar. In addition dies made of Graph-Mo Steel produce 3,000,000 pieces - - - three times the life offered by ordinary tool steels.

To increase production of your products and to secure longer tool or die life, use Graph-Mo or one of the other Graphitic Steels, Graph-Sil, Graph-Tung, Graph-Al or Graph-M.N.S. They machine at least 25% faster than competing steels, they provide stubborn resistance to wear and offer excellent response to heat treatment. These steels are readily available from the stocks of your nearest distributor or direct from the Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE MARK REG. U.S. PAT. OFF.
GRAPHITIC STEELS

WHY WE MAKE ONLY

Ground Thread

MILLING CUTTERS

Only *ground-thread* milling cutters are made by Pipe Machinery Company—because *only* this type has maximum precision and accuracy to begin with, and *only* this type holds uniform accuracy throughout long runs of precision work.

Cost more? Yes, but they do better work.

PM Ground-Thread Cutters are made only on special order—each tool designed, engineered and built to fit the job.

Send us detailed information—we shall be glad to quote you prices and delivery dates.

The PIPE MACHINERY COMPANY Cleveland, O.

WHAT HAS THIS TO DO WITH BROACHING?

SOMEWHERE in the dark of a Celebes moon, a silent shape steals closer, ever closer to the menacing bulk of a Japanese heavy cruiser. Suddenly . . . its mighty engines exploding in a thunderous roar . . . it drives home its lethal load and swerves, madly bucking, to make good its escape. Aiding in its headlong dash for safety, beyond the reach of vengeful guns, is the careful design and construction of its bow sections . . . a modern scientific development of the ancient, fundamental principle of the Wedge, which has served Man in countless usages from the first flint axe to the P. T. boat.

ALSO serving mankind in the scientific adaptions of of fundamental engineering principles, Lapointe has been ever first to combine imagineering with time-proven principles. Broaching is no longer just another method of removing metal. In the hands of those who plan for Tomorrow, broaching has become a powerful weapon in the war of production . . . and in those same hands, will provide revolutionary achievements in the days of peace, by making things quicker — cheaper . . . and better!

The first broaches, or drifts, as they were then called, were driven, one upon another, through the work part.

The LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.

MAKERS OF BROACHES AND BROACHING MACHINES

HOW TO CONVERT A HAND-OPERATED DRILL PRESS TO AN

Faster - Safer Better

PRODUCTION

A BELLOWS Controlled Air-Power Drill Press Feed, synchronized with a Bellows Controlled-Air Vise, brings automatic production to standard drill presses in a matter of minutes.

The Bellows Feed, at the touch of a handle, advances the tool through the work at a precise and exactly controlled rate. The Bellows Air Vise, or a custom-made fixture operated by a Bellows Air Motor, opens and closes automatically with the movement of the spindle. All the operator has to do: *Insert the work — push the handle.*

Bellows Controlled Air-Power Devices can quickly convert hand-operated drill presses, millers, grinders, and other machine tools to automatic production units. Not only is production increased by the automatic action, but the reduction in operator physical effort means less fatigue, less shop accident hazard, more uniform quantity and quality of production.

SEND FOR NEW, FREE PHOTO-FACTS FILE — Twenty-five photographs showing interesting applications of Bellows Controlled Air-Power Devices in leading plants all over America — together with a record of production accomplishments, installation costs. Send for your free copy, today.

The Bellows Co.

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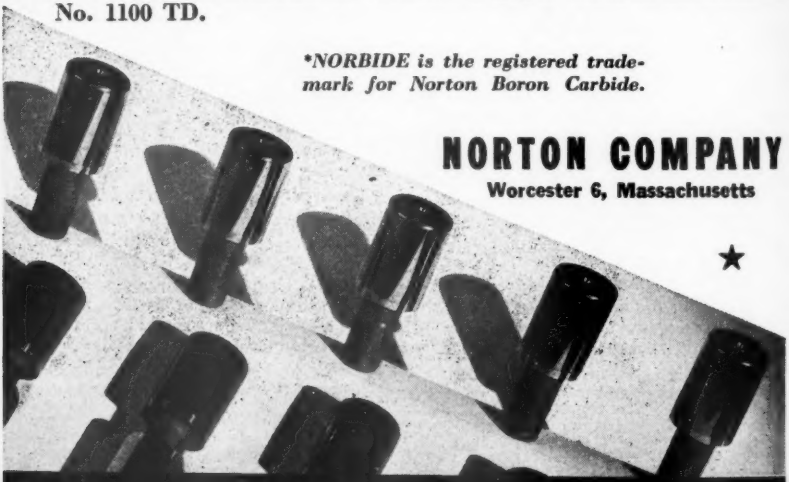
NORBIDE* GAGES *Last Longer*

Plant after plant is discovering that NORBIDE plug and ring gages and dial indicator gage points will outlast conventional types of measuring devices 100 times and more. This remarkable wearability of NORBIDE gages is due to the material's great hardness—second only to the diamond. Your regular gage manufacturer can supply you with these long-wearing gages, or for further information on NORBIDE gages write us for booklet No. 1100 TD.

**NORBIDE is the registered trademark for Norton Boron Carbide.*

NORTON COMPANY
Worcester 6, Massachusetts



***Hardest Material Made by Man**

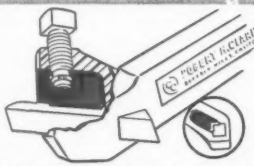
GOT IT!

A TOOL HOLDER *with 10 Times the Grip*

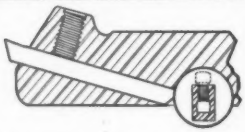
Tests show the new Clark Adjustable Tool Holder has the same rigidity as solid forged tools. Exclusive vise-grip jaw has twice the width and five times the length of the bearing surface found in other tool holders ... runs the *full* length of the cutter channel. Takes four sizes of round or square bits, large or short stub bits, undersize or out-of-round bits ... carbide bits and boring bars, and bits of brittle alloy. Double angle of head gives operator an unobstructed view of the cutting edge for better work control.

SPECIFICATIONS		
MODEL	SIZE	CAPACITY
60	0	1/8 to 5/16
61	1	3/16 to 3/8
62	2	1/4 to 1/2
64	4	5/16 to 5/8

With 15° or parallel cutter channel either left or right hand



Vise-grip jaw in the Clark Adjustable Tool Holder runs the full length of the cutter channel.



Conventional types hold tool bits at only one point, often causing bits to sag, or to be damaged or broken.

Write for complete Catalog TDJ-11

Adjustable Hole Cutter

Grinding Fixture

CLARK CUTTERS

Robert H. Clark Company

Adjustable Counterbore

Adjustable Facing Mill

ADJUSTABLE CUTTING TOOLS FOR ALL MATERIALS

Designed and Engineered for

Rapid, Positive Clamping, Maximum Open Clearance

DANLY
Kwik-Klamp
TOGGLE CLAMPS

To Speed Assembly, Machining Operations, Metal and Plastic Stamping.

For complete data, including tested pressure figures, send for the new Kwik Klamp Catalog.

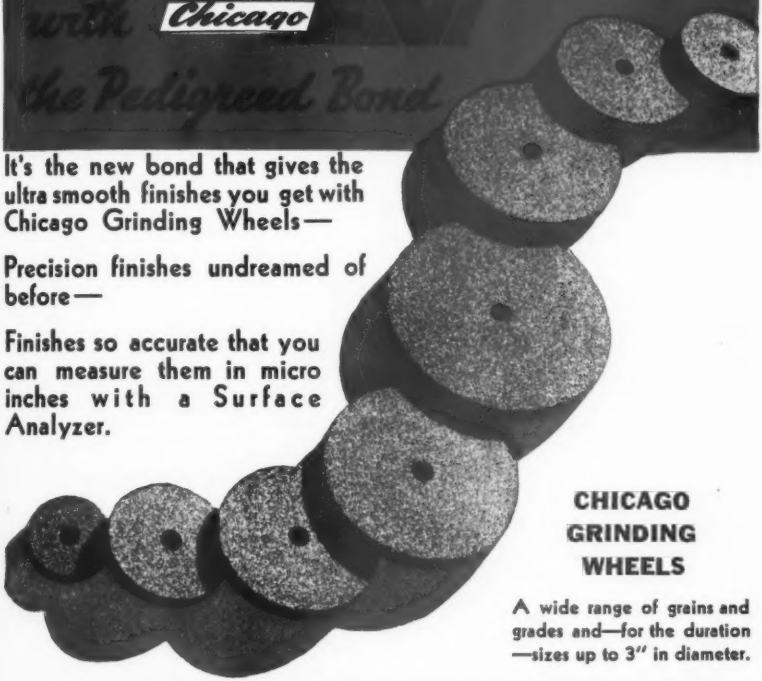
DANLY MACHINE SPECIALTIES, INC.

2100 South 52nd Avenue — Chicago 50, Illinois

BONDED

with Chicago

the Pedigreed Bond



It's the new bond that gives the ultra smooth finishes you get with Chicago Grinding Wheels—

Precision finishes undreamed of before—

Finishes so accurate that you can measure them in micro inches with a Surface Analyzer.

CHICAGO GRINDING WHEELS

A wide range of grains and grades and—for the duration—sizes up to 3" in diameter.

PERFECT FINISH INSURANCE

Whatever you have to finish—metals, alloys, plastics, wood, laminates or composition materials—you can do it better with Chicago Wheels.

Chicago Wheels have kept pace with the precision requirements of our war industries, and you can use them with confidence to finish civilian goods better in double quick time.

Write for Catalog listing all Chicago products and showing comparative photographs of finishes with different kinds of Wheels.

CHICAGO WHEEL & MFG. CO.

Headquarters for Mounted Wheels and Small Grinding Wheels

1101 W. Monroe St., Dept. TD Chicago 7, Ill.

Half a Century of Specialization has established our Reputation as the Small Wheel People of the Abrasive Industry.

TRY ONE FREE

We'll send without charge an FV Bond Grinding Wheel or a Mounted Wheel. Tell us size you'd like.

Send Catalog. Interested in TD-11

☐ Grinding Wheels. ☐ Mounted Wheels.

☐ Send Test Wheel. Size_____

Name_____

Address_____

The Dickerman Die Feed

1. Handles coiled stock up to 3/16" thick, widths up to 4".
2. Accurate, automatic; cuts labor time and material waste.
3. Adjustable from 0" to its maximum feed length in increments of .001".

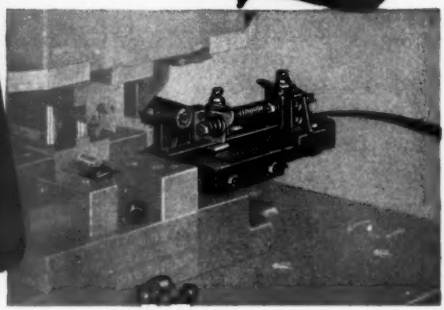
Send for booklet

The Dickerman Hitch Feed

1. Offers positive feed control, adjustable from 0" to its limit.
2. Feeds from any position on any style die.
3. Requires no connection to power shaft.

Made in two sizes, 2" and 4" Feeds

Send for booklet



YOUR PUNCH PRESS —

Works more hours each shift with a Feed attached to each Die

Set-up time for both feed and die is no longer than for die alone. With either the Dickerman Hitch Feed or Die Feed, the first cost is so low that you can easily have one for each of your frequently-used dies.

We Do Some Sub-Contracting

Frequently part of our facilities are available on sub-contract basis to manufacturers who need fine workmanship. We welcome such inquiries from firms whose product is essential to the war effort, and which will command an essential market after the war is won.

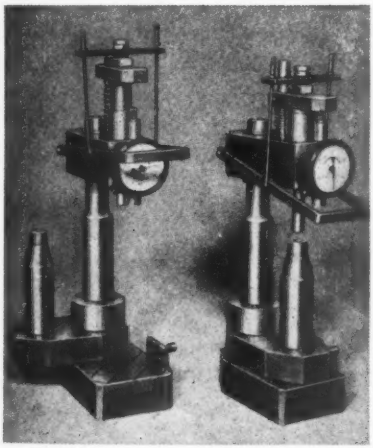
H. E. Dickerman Mfg. Co.

321TD ALBANY STREET SPRINGFIELD, MASS.

SUN DIAL INDICATOR GAUGES

for . . .
DEPTH, LENGTH,
THICKNESS,
HEIGHT,
LOCATION,
and *Special*
Measurements

HIGH-SPEED •
• ACCURATE • FOOL-PROOF •
• DURABLE •



This high-speed, durable, and accurate gauge enables you to take readings of variations as small as .0001". Each individual depth and length dimension can be checked visually, and errors determined. No expensive or complicated measuring equipment is required either for checking or setting. A simple master setting gauge supplied with each SUN DIAL INDICATOR GAUGE provides a quick and dependable method of setting and checking.

These instruments are being used in inspection rooms and on production lines by ordnance manufacturers working for the U. S. Army, Navy and Air Force.

Descriptive folder will be sent you on request—no obligation.

SUN TOOL AND GAUGE CORPORATION
380 Canal Street · New York City

DO YOU NEED *a Handy Tool* THAT WILL DO THINGS LIKE THIS?

★ It's the new Vise-Wrench — that combines the portability and convenience of ordinary pliers with the powerful locking grip of a vise. While work is being held, both hands can be free for operations. When completed, work can be released instantly.

Known as Model VG-10, the Vise-Wrench is 10 inches long and weighs 18 ounces.

Normal hand grip can attain a clamping pressure at the jaws up to 1 ton.

Jaws are alloy steel forgings with machined teeth (properly heat treated for greatest wear resistance) welded to stamped body construction (also heat treated).

Send for new catalog.

BUY WAR BONDS

KNU-VISE
INCORPORATED

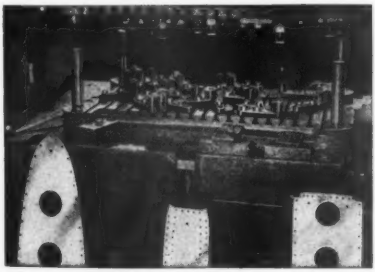
1330 PLUM ST. DETROIT 16, MICH.
4328 SAN FERNANDO RD. GLENDALE, CALIF.

YOU COULDN'T ASK FOR ANYTHING MORE SIMPLE — OR BETTER THAN

WHISTLER ADJUSTABLE PUNCH and DIE UNITS

Whistler Adjustable Dies work on any type press and because of their simplicity even new workers quickly learn to make pattern change-overs—increasing productive press hours. Absolute precision on short or long runs. Whistler design permits more perforations in a given area—often reducing press operations.

For quick and complete information on the advantages of Whistler Adjustable perforating and notching dies send a description or drawing of your work.



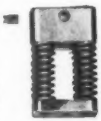
These pieces produced with Whistler Adjustable Dies clearly illustrate the re-use of same punch and die units.

These photographs show the simplicity of a Whistler Adjustable Punch and Die assembly. Every piece is interchangeable.

Self-locking bolts on punch holder drop into T slots of die shoe. Set-screw engages into recess at base of punch. Punch cannot turn or pull out in operation.

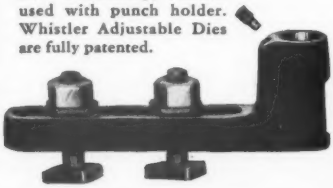
Punches of finest tool steel are machined to .0001" tolerances.

Stripper unit fits smoothly over punch—no "wobble". Flushed set-screw engages into groove on punch body. Stripper or punch quickly removed when desired.



Grooved heads on dies make lifting from holder quick and easy. Like the punches, dies are held firmly into holder by set-screw in recess at base. Whistler *precision* is known the world over.

Die holder has self-cleaning slug chute. Special design bolt heads present two bearing surfaces to T slot channel—self-locking, same as used with punch holder. Whistler Adjustable Dies are fully patented.



Write for the Whistler Catalog—every Production Executive should have it.

S. B. WHISTLER & SONS, Inc.

Over 25 Years of Tool and Die Making Experience

752-756 MILITARY ROAD BUFFALO, N. Y.

Why "NIBBLE" Templates?

Do ALL

MAKES THEM FASTER and SMOOTHER

...has no work table. Job must be carefully guided by hand. Finished edges are rough. Much material is reduced to waste chips. Work thickness is limited to thin plate stocks.

The DoALL's thin cutting blade follows layout lines accurately. Edges are smooth and straight. No metal is wasted. DoALL takes work a foot thick, or you can cut 100 or more shapes at one time from stacked sheets.

The DoALL has cut its way through millions of feet of metals, alloys, plastics, laminates, plywood and composition materials that have gone into war production work.

The DoALL laughs at former cutting records by doing internal and external sawing in 1/4 to 1/10 the time of other methods.

If there is one machine tool that deserves your attention now and after the war, it's the DoALL.

The circular DoALL ADVANTAGES tells a graphic, time-saving story. Send for copy.

DoALL

INDUSTRY'S NEW SET OF TOOLS

CONTINENTAL MACHINES, INC.

1303 So. Washington Avenue • Minneapolis 4, Minn.

WHY WALES-STRIPPIT HAS BECOME THE HEADQUARTERS FOR HOLE PUNCHING EQUIPMENT

Leading metal fabricators have found it profitable and time-saving to investigate Wales Hole Punching Equipment before putting holes in angles, channels or sheets by any method.

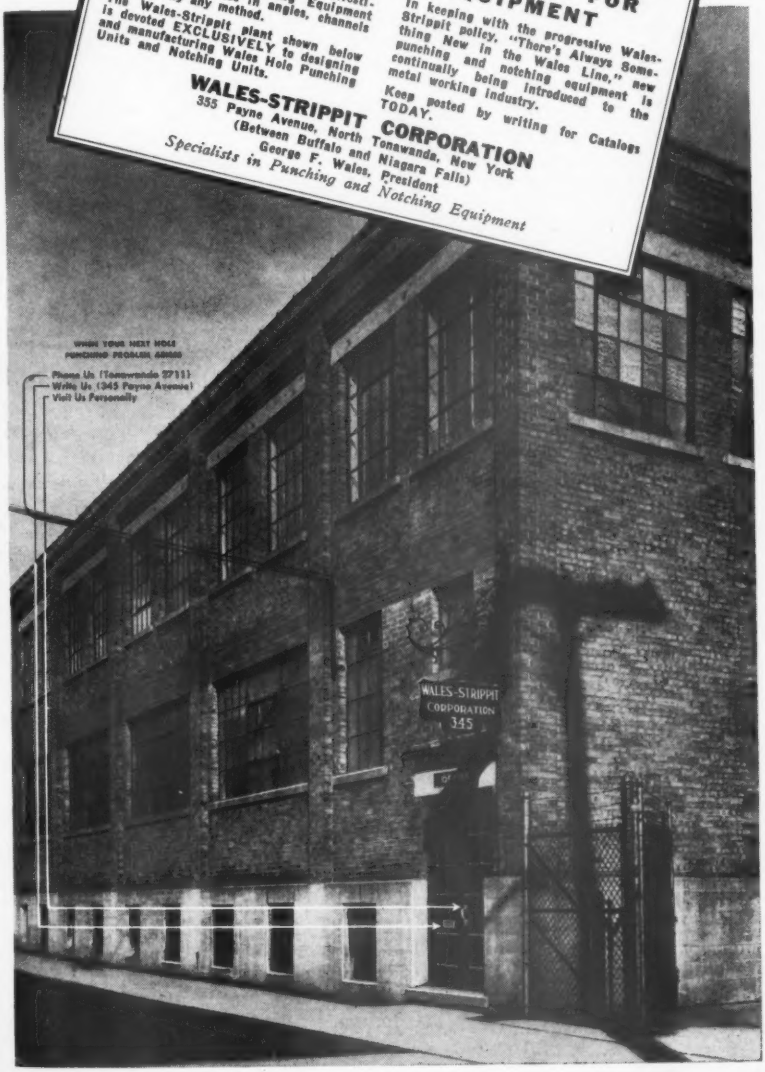
The Wales-Strippit plant shown below is devoted EXCLUSIVELY to designing and manufacturing Wales Hole Punching Units and Notching Units.

In keeping with the progressive Wales-Strippit policy, "There's Always Something New in the Wales Line," new punching and notching equipment is continually being introduced to the metal working industry.

Keep posted by writing for Catalogs TODAY.

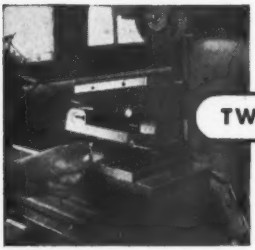
WALES-STRIPPIT CORPORATION
355 Payne Avenue, North Tonawanda, New York
(Between Buffalo and Niagara Falls)
George F. Wales, President

Specialists in Punching and Notching Equipment



3 SIMPLE STEPS MAKE AN ACCURATE ANGULAR SET-UP WITH THE MAGNA SINE

Using the MAGNA SINE Table of Constants supplied with each MAGNA SINE select the gage block that is equal to the sine of the desired angle. The sine bar method is the only truly accurate method of determining angles. This fact plus the extreme accuracy with which the MAGNA SINE is built means set-ups that are true to the highest degree of precision.



Place the gage block between the roller bar and the base plate, tightening the holding screw at the pivot for increased rigidity. The MAGNA SINE is now completely set. Nothing can move, yet there is no pressure to distort the set-up and cause inaccuracies. Setting up a compound angle is no more difficult than setting up a single angle. It simply requires one more gage block and a compound angle MAGNA SINE.

Now place the work on the MAGNA SINE and throw the switch. The work is held securely and is ready to grind. This simple procedure has taken but a few seconds at the most as contrasted with an hour or more often required for making angular set-ups using sine bars, angles and conventional methods. Every grinder doing an average amount of angular grinding work should be equipped with its own MAGNA SINE for better work at lower cost.

Robbins ENGINEERING COMPANY

318 MIDLAND AVE. • DETROIT 8, MICHIGAN

Only 30 of these Slightly Used

SAV-WAY HAND INTERNAL GRINDERS

CEILING PRICE
$4,970.00

•

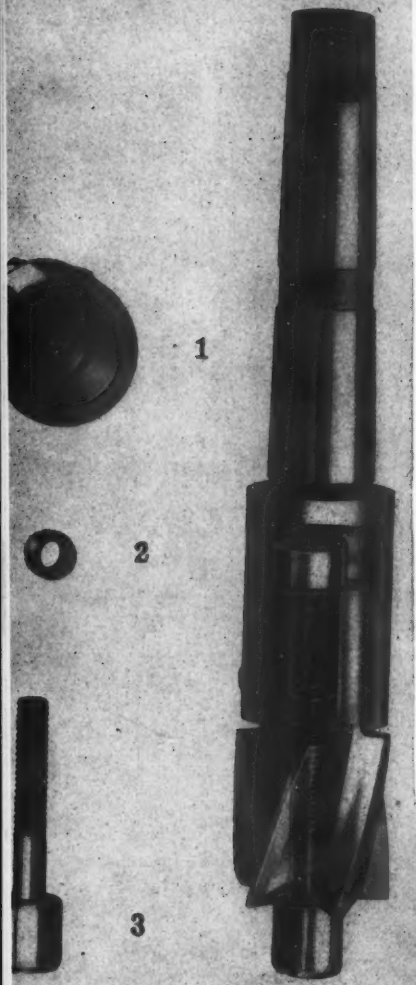
NET PRICE
$3,995.00

WIRE COLLECT FOR ACTUAL PHOTOS AND SPECIFICATIONS

- ★ **No Priority Needed**
- ★ **Immediate Delivery**
- ★ **New Machine Guarantee**
- ★ **Equipped with Famous Gold Seal Spindle**
- ★ **Neoprene-Insulated against Vibration and Distortion**
- ★ **Ideal Machine for Postwar and Tool Room Work**
- ★ **Practical Service Engineer Will Demonstrate in Your Plant**

Sav-Way **INDUSTRIES**
Machine Tool Division
BOX 117, HARPER STATION, DETROIT 13, MICHIGAN

BUILDERS OF HAND AND HYDRAULIC INTERNAL GRINDERS • PRODUCERS OF GOLD SEAL SPINDLES • PLUG GAGES • MICROMETER CHECKERS PRECISION AIRCRAFT, AUTOMOTIVE AND ORDNANCE PARTS



Introducing the eccentric principle in its design to completely equalize the torque load on the holder and the mating driving member of the cutter . . . the Moreland Counterbore Drive is shear proof. The driving member of the cutter fits into a cylindrical off-center hole in the holder . . . both shank of cutter and corresponding hole in holder being round in shape and eccentric in location only. Without any sharp edges, pins or wedges, this method of coupling cutter (4) and holder (1) eliminates any tendency to shearing action — it is practically as strong as a piece of solid bar stock of the same diameter and analysis. Proportionately longer cutter life can also be expected. The pilot (3) has no function other than as a guide — cutter can be drifted from the holder without disturbing its location. The pilot hole is ground to close limits and extends back, the same size, the full length of the flutes where it is enlarged to provide for inserting a brass nut (2) to hold the pilot in place. A brass nut is strong enough for the normal purpose of the pilot, but at all times when the guide hole is undersized and the pilot binds, the threads of brass tend to strip and prevent cutter damage.

A request on your letterhead will bring a twenty-page catalog which describes sizes of holders . . . standard and special cutters available.

MORELAND TOOL COMPANY

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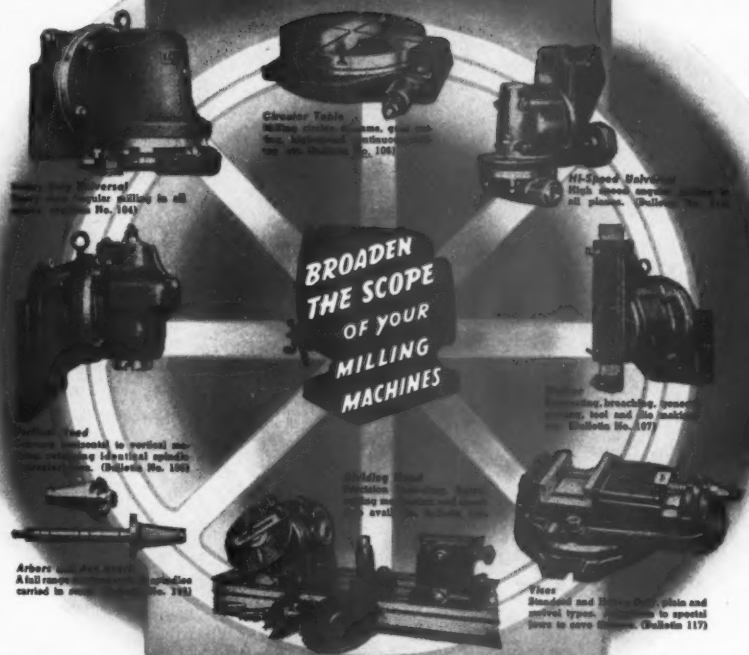

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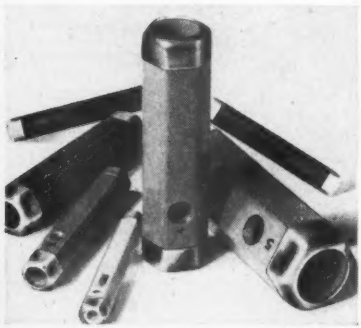

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EDITORIAL INDEX

Features

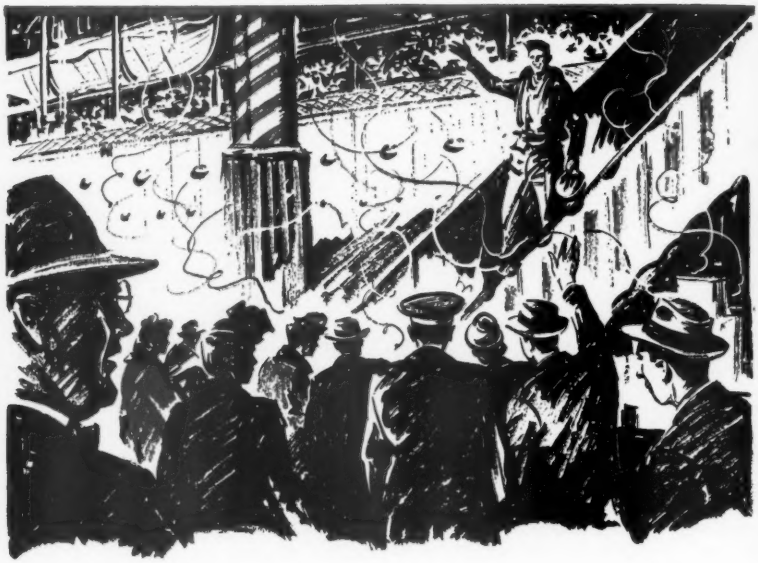
	Page
Tool & Manufacturing Supplies Inventory Problems, by Albert W. Ehlers	101
Materials Weight Tables	106
Three Dimensional Drawings, by L. S. Sanders	111
Frankford Arsenal Establishes Gage Acceptance Clinic	113
T D J Crossword	114
A Time Estimate for a Compression Mold, Part III, by Gordon B. Thayer	115
Design of Molded Plastics Parts—Contour Design—Part III, by Warren V. Prince	121
A Plastic Drill Jig for Assembling the "Baltimore" Wing Tip	126
Material Conservation Sustains Production, by E. R. Patterson	128

Briefs

Value of Machine Tool Shipments by Major Types (Chart)	188
Set Rotating Angle with Gage Blocks	190
Tukon Tester	192
Gages for Checking Pump Gears	194
Hydraulic Gauging and Assembly Press	196
Portable Coolant System and Pump	198
New Attachments for Wickman Automatics	200
Buttress Tooth Saw Blade Frees Chips	202
Universal Compound Angle Plate	204
Plastic Caps Protect Hydraulic Tubing	206
New Large Size Mold Bases	208
Plexiglas Bell Cap Center Punch	210
Shot Peening and the Fatigue of Metals	214
New Electric Furnace by Thermo Electric	218
Portage Rotary Table Cast of Meehanite	220
Hydraulic Press by Powder Metallurgy	222
Catalin Corporation Advances Two	224
Engineered Plastics	224
Steel, Chrome Plate and Carbide Gages by Crescent	226
Lowe Electric Riddle Has Many Uses	228
Rolamarker is Handy Shipping Room Tool	230
Cylindrical Work on Surface Grinders	232
V-Nide Thread and Plug Gages	234
Hoke Type Carbide Gage Blocks	236

Coming in November

Estimating Systems for Mold Shops, by Gordon B. Thayer
Design of Plastics Parts and Molds, Part IV, by Warren V. Prince
A Plastic Tooling Story from a Leading Aircraft Shop
Tool Room Surface Grinding, by J. E. Corbett
Precision Taps, by R. R. Williams
Final Installment, Materials Weight Tables, by Geo. H. Thompson
Veteran Reemployment, by Harold Ashe
Combination Blank, Draw and Pierce Die, by Edward Heller



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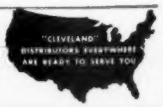


WILL WORDS BECOME DEEDS?

As this is being written American men and women throughout the length and breadth of our land are exercising one of the sacred rights guaranteed to them by their constitutional form of government. Unless the vote of the electoral college does not reflect the popular vote, we shall have as President of the United States the man who is the choice of the larger segment of American voters.

The campaigns for election or re-election were hard-fought and the issues bitterly contested. Name-calling was frequent, the lie was passed and reputations were made and unmade daily by friend or foe.

On January 20, 1945, begins the new presidential term. If Thomas Dewey has been chosen, that is the day for him to realize that he is the President of *all* of the people. If Franklin Roosevelt is re-elected he will not have to wait until Inauguration Day; he should so realize immediately or—shall we say—continuously.

Both men have been described as the representatives of groups seeking special privileges. Neither man will be faithful to his trust if such charges are borne out in his administration. We want peace in our country as well as throughout the world during the years to come and special privileges to men or groups are not conducive to such peace. In our country we shall achieve it only if Capital, Labor and the Farmer look first to the common cause and not the selfish one. Furthermore, these groups must be freed from the unnatural elements within their ranks which prey upon them and ultimately bring down upon us the exorbitant costs of government, of business operation and eventually of living itself.

If we would have national prosperity and have it on a solid foundation there must be intelligent co-operation between Capital, Labor and the Farmer. It does no harm to repeat that just as "the laborer is worthy of his hire" so Capital is entitled to a fair return. In our country opportunity is for every man and woman. The American system of free enterprise provides such opportunity and both candidates are on record that they

believe in it. The words of President Roosevelt, delivered in his campaign speech from Chicago on the night of October 28th, expressed perfectly the attitude which his fourth term administration should have toward American industry and business. Here is what he said:

"I believe in free enterprise—and always have.

"I believe in the profits system—and always have.

"I believe that private enterprise can give full employment to our people.

"I believe in exceptional rewards for innovation, skill and risk-taking in business.

"Business, large and small, must be encouraged by the government to expand their plants and to replace their obsolete or wornout equipment with new equipment, and, to that end, the rate of depreciation on these plants and facilities for tax purposes should be accelerated.

"We shall lift production and price controls as soon as they are no longer needed—encouraging private business to produce more of the things to which we are accustomed and also thousands of new things, in ever-increasing volume, under conditions of free and open competition."

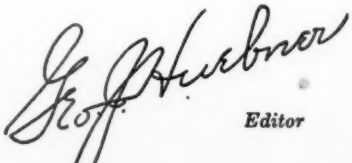
Later in the same address President Roosevelt said:

"The future of America, like its past, must be made by deeds—not words."

We want to accept these words at their face value. We do not want to think of them as an expedient political utterance but as the firm conviction of the executive who spoke them and his promise for the future if he is re-elected.

Governor Dewey has expressed himself similarly and that should assure our country during the four years beginning in January 1945 its greatest opportunity of many years. For Industry and Labor it is more than an opportunity—it is a responsibility. Industry is as earnestly preparing to discharge the obligation to reconvert to peace-time production and maintain employment as it strove to achieve its miraculous war production.

If, on the other hand, Labor is successful in promulgating un-American ideologies we may look for a continuance of strife on the home front. But under these circumstances we should be able to look to the President—either man—to translate words into deeds. If he does—be his name Roosevelt or Dewey—he will have the supreme satisfaction of leading his people through four years of unparalleled prosperity and happiness.



Editor

TOOL & MANUFACTURING SUPPLIES

· INVENTORY PROBLEMS ·

by Albert W. Ehlers
McQUAY-NORRIS MFG. CO.
Connersville Division

It is the opinion of the writer, substantiated by subtle warnings of both governmental control agencies and trade journal forecasts, that the peak of our war production is at hand. Continued emphasis will be placed upon the production of selected items such as heavy artillery and rockets whose expenditure during the progress of the war indicates an increasing need. Cut-backs and cancellations of present prime and sub-contracts are now taking place in rather a well ordered manner, but the progress of the conflict in both the European and Asiatic theatres suggests an increased tempo of both cancellation and cut-back.

This is not the time for us to rest upon our production laurels with the assumption that the war is in its final stages. The need for well ordered and continuous pressure upon production will still be with us until the final empty cartridge case is ejected from the final empty gun. However, the need for hectic hedging on supplies due to the fear of delayed deliveries is now over.

Adjustment to Conversion

In fairness to their trade in general, Tool Designers, Process Engineers and Tool Control Supervisors must play an important part in easing the shock of conversion to civilian production. They owe a responsibility not only to their own particular organizations in preventing excess inventories and the waste of obsolescence, but they also owe a responsibility to their allied trades which supply such items as cutting tools, dies, tool steels, grinding wheels, abrasives, oils, jigs, fixtures and machine tools.

All of these trades mentioned are faced with the same conversion problem that is facing the parts and completed unit manufacturers. Many readers of the Tool & Die Journal are vitally concerned in the manufacture and sale of the above mentioned items. They should be assisted in their re-adjustment program by judicious and well planned requirements from the Tool Designers, Process Engineers and Tool Control Supervisors. A continued inflated picture of war boom orders will only result in mutual costly cancellation to both purchaser and vendor. True, there is provision made in the present governmental cancellation proceedings that allows the manufacturer recourse on process and material when faced by cancellation. However, this only creates a distress market and eventual payment by taxation on both the corporation and the individual.

Easier Delivery

I believe I may safely state that these suppliers to the trade are now in a position to furnish most standard items in the 30-90 day delivery periods. A few special items require a longer delivery, but this situation is improving daily.

The grinding wheel delivery situation is a typical example. We can remember when centerless grinding wheels and large hypo-lapping wheels could not be safely ordered under a 4-6 months delivery differential. These same wheels can now be readily supplied in 6-8 weeks. Another example is the procurement of special tooling such as dove-tailed and circular form tools, broaches and contour milling cutters. The tool quotations used to carry the sad news of 18-24 weeks delivery with even a high priority. Now quotations from the same vendors read a normal 6-8 weeks delivery and their

promises are being held. In some cases the specialized tool manufacturer or jobber can even lower this delivery time.

The well worded slogan, "It is later than you think", can be aptly applied *now* to all tool and manufacturing supply inventories.

Salvage and Obsolete Utilization Program

If existing inventories are to be reduced and obsolescence avoided, a well developed plan of action aided by the cooperation between all departments in the manufacturing organization has to be put into immediate effect. It is the writer's object in this article to describe a plan that is producing steady results in reducing inventories and obsolescence.

The first step in formulating such a plan is to select one well qualified individual to head up what might be termed a "Salvage and Obsolete Utilization Program". This individual should be well versed in purchasing and stock room procedures, basic engineering design and actual manufacturing operations. While this looks like a large order of required ability at first glance, such an individual may well be found in the Time Study, Planning, Tool Control or Engineering Departments. When selected, this individual must have the unqualified support of the management and of all department heads.

The initial program naturally divides itself into the following three distinct phases which must be carried on concurrently.

PHASE ONE Sale or disposal of standard items for credits to original vendors or to other manufacturers using the same items.

PHASE TWO Conversion of tools, jigs, dies, fixtures and supplies already on hand to requirements of present or future needs.

PHASE THREE Substitution of existing inventory items for other items called for on Process Sheets in conjunction with the Process Engineer.

Phase One: Disposal

Phase One is dependent upon the utmost cooperation of the Purchasing Department. Many vendors who have established long time contacts with this department are more than willing to help and will accept for "return for credit" many standard items with only a handling charge.

In some cases this handling charge may result in a distinct loss on inventory book value due to existing sales agreements with jobbers and distributors. However, if this is the case the loss will be confined to from five to thirty percent. If a higher loss percentage is indicated as in the case of thirty percent, the individual concerned with salvage and obsolete disposal should carefully investigate every possible means of utilization by substitution, conversion or by anticipating future requirements. In other instances the items may be sent direct to another customer of the vendor when shortages exist of the particular item in the vendor's stock, at no loss other than the freight involved which may or may not be credited.

Classification of Surplus Items

The real secret behind this type of Purchasing Department-Vendor cooperation is the preparation of adequate lists of classified items which must be complete in every detail. Taking two specific items as an example, the information listed should be prepared in the following manner:

Amt.	Type and Description	Vendor	P. O. No.	Date
12	Convex Milling Cutter. 4" O.D. 1" Arbor ¾" Dia. convex. 16 teeth. Form Relieved Catalog No. 502. Page 43.....	X	D-5034	4-16-43
6	Alum. Oxide Grinding Wheel. 3746 J 5BE Norton. S/S (Straight Side) 20 x 6 x 12 Used on S.A.E. 0000 Steel. Centerless..	Z	D-3278	3-13-43

It must be assumed that items purchased from vendor "X" are of no interest to vendor "Z".

This type of descriptive data can be easily understood by anyone and furnishes the vendor with an index to the status and terms of the original purchase order. The writer has received too many lists of excess tooling from

both governmental and private sources where items are listed in such a fashion that no one without a blue print or the necessary acumen of a Philadelphia lawyer could determine just what they were offering.

A clearly indicated listing will demand the attention of an interested party and it will not immediately land in the waste basket as is the case where items are inadequately described.

Circulation of Classified Lists

After completed lists are compiled and mimeographed it now becomes a business of "direct mail advertising and selling". Classified copies of surplus items purchased from a particular vendor must be forwarded to their main office, district offices and above all to their immediate salesman handling your account. This listing should be accompanied by a short concise letter to personnel in charge of sales asking for their cooperation. The personnel information can usually be supplied by the Purchasing Department, but necessary clerical work and consistant follow-up should be assumed by the "Salvage and Obsolete Utilization" supervisor.

It has been found that many vendors will indicate items they can immediately use or may use in the future. They also will usually indicate special items that cannot be used and should be removed from subsequent follow-up lists. The salesman in your territory, having a copy of your list and not being dependent upon a branch office or home office bulletin, can often place some items direct to another of his customers if immediate shipment cannot be made by his company.

The classified lists of excess inventory items may also be sent to manufacturers of products similar to those of your plant, or to plants using the same types of machinery. This exchange of information often results in moving items at no loss to anyone. Of course, if your manufacturing plant maintains several divisions within the organization, those divisions should be the first "prospects" contacted in the attempt to move the surplus or obsolete items.

Phase Two: Conversion

Phase Two, as previously outlined, requires the cooperation of the Engineering and Tool Control Departments. However, these departments must have direct assistance in the matter of suggestion and application by the "S & OU" supervisor.

A designer may indicate a hot-die steel of Carpenter-Stentor characteristics for a forming or quenching die. However, the Stores Department may have a surplus of Carpenter-DXY steel. If the designer has this surplus pointed out to him with the suggestion that the two steels have similar characteristics of application, then the surplus item may well be used if the design and application permit.

Stagnant stock items of tool steels, brasses and bronzes may also be utilized with Engineering Department cooperation. If any OD of this stagnant stock does not comply with immediate needs it can be turned down to required diameters cheaper than selling the stock back to vendors. Of course extra time is expended in roughing cuts, and the chip and turnings salvage will not compare with the original billet or bar stock size poundage as purchased, but the writer has found that in most instances the loss in time and material is held lower than ten percent.

The studied use of, "Grinding Wheels and Their Uses", as compiled and published by the Grinding Wheel Manufacturers Association, 27 Elm St., Worcester, Mass., will allow many grinding wheel substitutions to be made. Very often an S-7 wheel which is the hardest of the S, or soft grades, can be adequately substituted for an M-1 which is the softest of the medium grades. On roughing operations, the writer has found that in many cases a two or three grade difference can be adequately compensated for in work speed and traverse feed changes with little or no loss in efficiency. However, do not misunderstand the writer; he agrees that there is the right grit, grade and bond for every grinding job. The increases in efficiency can be noted as the wheel specifications are changed to conform to the requirements of the job. However, as the changes approach the perfect wheel for the job, the old law of "diminishing returns" becomes evident so that the percentage of efficiency gained or lost by a grade or grit change is very small

and permits the judicious substitution in the interest of salvage and conversion of surplus grinding wheels.

A Case History

A particular example of the reasoning brought out in the preceding paragraph is the case history of a cylindrical grinding job. This job was particularly "fussy" as to finish, and production requirements were such that every possible part was needed to meet delivery requirements. The grinding wheel stipulated for this grinding of the OD of a hardened steel bearing shell was a 24 x 5 x 12 60L5BE aluminum oxide wheel. This wheel used on a new 10" Hydraulic Norton Grinder with oscillating wheel movement, produced good parts quickly and economically. However, a wheel delivery from the vendor was delayed and in desperation a rather unorthodox substitution was attempted.

A surplus of 20 x 6 x 12 60L5BE centerless grinding wheels was evident to the "S & OU" supervisor. He found, by using longer wheel stud bolts and by doing an hour's welding job on the wheel guard, that the 6" wide wheel could be accommodated. The operator and foreman were frankly sceptical but as there was no alternative other than to shut the job down, the wheels were tried. True, the SFM had been reduced approximately 20% by the smaller diameter wheel, but changes in the work speed corrected this. The Inspection, Time-Study and Process Engineering Departments could find little or no difference in the finished part or in the efficiency of operation so the surplus of centerless grinding wheels was profitably put to use on a regular production job.

The writer again reminds the reader that such changes of specifications on sequence of operation sheets must be carefully evaluated for changes in the cost of production and that they must have the full accord and permission of the Time-Study or Standards Department. The loss of a few pieces per hour will offset any gain accomplished in the utilization of the surplus item. A large apparent savings in dollars can be easily dissipated by the loss of a few cents of efficiency per hour during a production run.

Surplus Cutting Tools

As to the utilization of excess stocks of reamers, drills, milling cutters, etc., the methods of conversion and salvage are common knowledge. However, the full use of this stock can never be exploited unless one individual such as the "Salvage and Obsolete Utilization" supervisor possesses a lively imagination and is capable of selling the conversions and substitutions to the proper departments thru the proper channels.

Reworking Jigs and Fixtures

As to the use of obsolete jigs and fixtures; the standardization of engineering design for multiple use is an established procedure in most organizations. However, many designers have the tendency to tool a job with "clean lines" and disregard the possibility of the salvage and conversion of existing surplus facilities. Also, many Engineering Departments have grown rather lax in adequately cross-indexing uses for jigs and fixtures and have allowed existing records to lapse due to the acute shortage of Engineering Department personnel. Here, too, the "Salvage and Obsolete Utilization" supervisor must do a selling job. Instead of selling the surplus items to a vendor or outside customer he must sell them back to his own organization.

A good plan is to segregate items into classes and use an A, B, C, D, etc., master drawing for essential dimensions and use this as the flyleaf for each section of the mimeographed list furnished the Engineering Department. Thus, the designer can quickly ascertain if a suitable fixture or jig is available for reworking. If this listing is pushed by the "S & OU" supervisor, the designer will get accustomed to using it and the resulting savings effected will be quickly noted.

The imaginative use of gas and electric welding, brazing, silver soldering, etc., has put the productive harness on many an obsolete jig or fixture whose destination otherwise would have been the scrap heap. Sympathetic cooperation of the Tool Salvage and Tool Making Departments is a required necessity. Many of their ideas are so practical and unique that they would be otherwise overlooked by individuals not concerned with everyday operation of tool room equipment. If these departments are salavage conscious they will contribute greatly to the success of the program. It is up to

the "Salvage and Obsolete Utilization" supervisor to see that they are so educated and are sold on remaining educated.

Phase Three: Substitution

Phase Three of the Salvage and Obsolete Utilization Plan has already been touched on in the reference to the grinding wheel substitution. However, the plan goes farther into the problem than mere substitution brought about by emergency necessities. The place to really sell the excess inventories is in the Process Engineering Department. Rather than make a substitution on an already prepared sequence of operation sheet, he should promote his plan so that the excess items are put on the original sequence of operation sheets.

The "S & OU" supervisor knows that he has an excess inventory of a standard convex milling cutter due to a change in machining practices on another job. Three #2 milling machines are idle in department "X". If he can get these machines into use on the new job and the bolt slot on a particular part is adjusted, the convex cutters and the machines can be put into use, resulting in his excess inventory melting away. The process engineer might have used the horizontal broaching machine in department "Z" if he had not been continually pestered by the "S & OU" supervisor with the same query, "let's get rid of these convex cutters on the next bolt slot job."

The possibilities of this type of utilization of excess inventory supplies are too numerous to mention and I know that the reader is already concocting a better example to illustrate the plan. However, I wish to emphasize again that the success of any phase of the plan or the entire plan itself depends upon a consistent and well planned campaign of suggestion and follow-up.

"Use It Up—Make It Do"

Another well worded war slogan sums up the entire basic idea of this article.. "Use it up..Make it do". The buggy ride of cost plus is over, and once more profits will be measured by manufacturing costs and overheads. Excess inventories not only cost money in inventory taxes but they are idle dollars held down by chains of obsolescence or they are idle dollars taking a nap on some dusty shelf in the stock crib. There will be little room in the postwar world for idle dollars and it behooves every individual in any organization to see that the idle dollars are put to work.

In the past, Tool Designers, Process Engineers, etc., have not been concerned with inventories. It was a control job.. a Stores Department headache. What did they care if some cutter manufacturer was loaded with orders based on a "blown-up" war production? It was no concern of theirs if the grinding wheel supplier was losing sleep wondering what would happen when the pyramiding surplus stocks of wheels were dumped on a tightening market.

To establish and maintain a postwar America with good business and good standards of living will take the same type of teamwork that is winning the production battle. Let's ease conversion for ourselves and the other fellow by ordering what we need and also reduce the possibility of an avalanche of excess inventory by using it up now.

*

Manufacturers of Dielectric Heating Equipment

In response to a number of inquiries regarding manufacturers of induction heating equipment, we furnish the following list of such manufacturers: Federal Telephone & Radio Corp., 28 Halsey St., Newark, N. J.; General Electric Company, Schenectady, N. Y.; Girdler Corporation, Louisville 1, Ky.; Induction Heating Corporation, 389 Lafayette St., New York 3, N. Y.; Northwest Syndicate, Inc., 711 St. Helens Ave., Tacoma 1, Wash.; Airtronics Mfg. Co., 5245 W. San Fernando Road, Los Angeles 26, Calif.; Illinois Tool Works, 2501 N. Kuder Avenue, Chicago 39, Ill.; Fostoria Pressed Steel Corporation, Fostoria, Ohio; Radio Receptor Company, Inc., 251 W. 19th St., New York 11, N. Y.; RCA-Victor Division of Radio Corporation of America, Camden, N. J.; Utah Radio Products Co., Utronic Division, 820 Orleans St., Chicago 10, Ill.; Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; North American Philips Co., Inc., 100 East 42nd St., New York, N. Y.

MATERIALS WEIGHT TABLES

The tables following on pages 94, 95, 96 and 97 comprise the fourth installment of the Materials Weight Tables.

The tables were originally calculated and compiled by Geo. H. Thompson, Treasurer, The Cleveland Metal Stamping Co., and have been in practical, everyday use for many years. Their working value has, therefore, been time tried and proved.

Designed to reduce to a minimum the work of calculating the total weight of steel (based on a steel of 1 cu in = .2836 lb) required for a given press run, the tables are so basic as to be readily applicable for other materials and purposes.

The use of the tables is of the utmost simplicity. For instance, given a job that is to be blanked out of strip stock 1⅛" wide, with a "pitch" or length of stock feed per blank of 5", and an assumed stock thickness of .044": In the column headed by 1⅛" we find the constant 1595.25 opposite 5". Multiplying 1595.25 by .044 gives 70.191 or 71 as the weight in pounds for 1000 pieces 1⅛" x 5" x .044".

Suppose, however, that the stock requirement was 1⅛" x 5 9/16": In such a case we refer to the same column headed by 1⅛", and, to the constant given for 5" we add the constant shown for 9/16", or 1595.25 + 179.47 = 1774.72. This new constant multiplied by .044 gives 78 lbs as the weight of 1000 pieces 1⅛" x 5 9/16" x .044".

Additionally, the tables will give the weight of a single piece of stock by moving the decimal point three places to the left. For instance, to find the weight of a bar of steel 2¼" x 11" x 4": In the column headed by 2¼" we find the constant 7019.10 opposite 11"; therefore by moving the constant's decimal point three places to the left (making it 7.02) and multiplying by 4 we get 28.08 as the weight in pounds of a bar of steel 2¼" x 4" x 11". At this point it should be noted that the fastest use of the tables can be made by so choosing the constant that it may be multiplied by the simplest of the several factors. For instance, in the example just given we could have used the constant given for 2¼" x 4", or 2.5524 (after moving the decimal point three places to the left). This multiplied by 11 also gives a weight of 28.08 lbs but is a more involved multiplication chore than in the first instance. In other words, 7.02 x 4 is a simpler multiplication than 2.5524 x 11.

The examples given above have been for a steel of 1 cu in = .2836 lb upon which weight the tables were initially calculated.

The tables will serve for weight calculations of any material by multiplying the weight of the stock in steel by the appropriate conversion factor. For instance, in the example given for steel 1⅛" x 5" x .044" weighing 71 lbs per 1000 pieces, multiplying the steel weight by 1.136 gives a requirement of 81 lbs for the same job in sheet copper.

Even when worked entirely "by hand" the tables are a valuable time saver. However, for those who are used to working entirely with and depending upon a slide rule, the tables still serve as a shortcut. A given constant multiplied arithmetically by the stock thickness in thousandths is appreciably faster than running through the slide rule settings for *length* x *width* x *thickness* x *weight*, and, at the same time, more accurate, which is most important as we deal in greater quantities. Nevertheless, the speed and convenience of manipulating only one setting of the slide rule to *constant* x *thickness* permits a double check for accuracy and is still a time saver.

Stock requirement calculations based on conventional tables of gauge weight per square foot do not facilitate taking into consideration the weight variable occasioned by the stock thickness tolerance. In contrast to this, compare the ease with which our tables may be employed to determine the range in weight due to thickness variations. In the case of a stock thickness of .050", plus or minus .005", by the quick multiplication of the constant by, first, .045 and second by .055 we accurately arrive at the high and low limits.

In conclusion, the combined accuracy and facility of these tables is such as to permit the calculation of stock requirements with the assurance that variables are reduced to a minimum.

MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement) — PART VII[3]

Calculated and Compiled by Geo. H. Thompson

	13/16" x	7/8" x	15/16" x	1" x	1 1/16" x	1 1/8" x
1"	230.43	248.15	265.88	283.60	301.33	319.05
2"	460.85	496.30	531.75	567.20	602.65	638.10
3"	691.28	744.45	797.63	850.80	903.98	957.15
4"	921.70	992.60	1063.50	1134.40	1205.30	1276.20
5"	1152.13	1240.75	1329.38	1418.00	1506.63	1595.25
6"	1382.55	1488.90	1595.25	1701.60	1807.95	1914.30
7"	1612.98	1737.05	1861.13	1985.20	2109.28	2233.35
8"	1843.40	1985.20	2127.00	2268.80	2410.60	2552.40
9"	2073.83	2233.35	2392.88	2552.40	2711.93	2871.45
10"	2304.25	2481.50	2658.75	2836.00	3013.25	3190.50
11"	2534.68	2729.65	2924.63	3119.60	3314.58	3509.55
12"	2765.10	2977.80	3190.50	3403.20	3615.90	3828.60
1/16"	14.40	15.51	16.62	17.73	18.84	19.94
1/8	28.80	31.02	33.23	35.45	37.67	39.88
3/16"	43.20	46.53	49.85	53.18	56.50	59.82
1/4"	57.61	62.04	66.47	70.90	75.33	79.76
5/16"	72.01	77.55	83.09	88.63	94.16	99.70
3/8"	86.41	93.06	99.70	106.35	113.00	119.64
7/16"	100.81	108.57	116.32	124.08	131.83	139.58
1/2"	115.21	124.08	132.94	141.80	150.66	159.53
9/16"	129.61	139.58	149.55	159.53	169.50	179.47
5/8"	144.02	155.09	166.17	177.25	188.33	199.41
11/16"	158.42	170.60	182.79	194.98	207.16	219.35
3/4"	172.82	186.11	199.41	212.70	225.99	239.29
13/16"	187.22	201.62	216.02	230.43	244.83	259.23
7/8"	201.62	217.13	232.64	248.15	263.66	279.17
15/16"	216.02	232.64	249.26	265.88	282.49	299.11

[1]Based on a steel of 1 cu. in. = .2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

[3]Part I, Tool & Die Journal, May 1944
Part II, Tool & Die Journal, June 1944
Part III, Tool & Die Journal, July 1944
Part IV, Tool & Die Journal, August 1944
Part V, Tool & Die Journal, September 1944
Part VI, Tool & Die Journal, October 1944

MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement)

Calculated and Compiled by Geo. H. Thompson

	1 3/16" x	1 1/4" x	1 5/16" x	1 3/8" x	1 7/16" x	1 1/2" x
1"	336.78	354.50	372.23	389.95	407.68	425.40
2"	673.55	709.00	744.45	779.90	815.35	850.80
3"	1010.33	1063.50	1116.68	1169.85	1223.03	1276.20
4"	1347.10	1418.00	1488.90	1559.80	1630.70	1701.60
5"	1683.88	1772.50	1861.13	1949.75	2038.38	2127.00
6"	2020.65	2127.00	2233.35	2339.70	2446.05	2552.40
7"	2357.43	2481.50	2605.58	2729.65	2853.73	2977.80
8"	2694.20	2836.00	2977.80	3119.60	3261.40	3403.20
9"	3030.98	3190.50	3350.03	3509.55	3669.08	3828.60
10"	3367.75	3545.00	3722.25	3899.50	4076.75	4254.00
11"	3704.53	3899.50	4094.48	4289.45	4484.43	4679.40
12'	4041.30	4254.00	4466.70	4679.40	4892.10	5104.80
1/16"	21.05	22.16	23.26	24.37	25.48	26.59
1/8"	42.10	44.31	46.53	48.74	50.96	53.18
3/16"	63.15	66.47	69.79	73.12	76.44	79.76
1/4"	84.19	88.63	93.06	97.49	101.92	106.35
5/16"	105.24	110.78	116.32	121.86	127.40	132.94
3/8"	126.29	132.94	139.58	146.23	152.88	159.53
7/16"	147.34	155.09	162.85	170.60	178.36	186.11
1/2"	168.39	177.25	186.11	194.98	203.84	212.70
9/16"	189.44	199.41	209.38	219.35	229.32	239.29
5/8"	210.48	221.56	232.64	243.72	254.80	265.88
11/16"	231.53	243.72	255.90	268.09	280.28	292.46
3/4"	252.58	265.88	279.17	292.46	305.76	319.05
13/16"	273.63	288.03	302.43	316.83	331.24	345.64
7/8"	294.68	310.19	325.70	341.21	356.72	372.23
15/16"	315.73	332.34	348.96	365.58	382.20	398.81

[1]Based on a steel of 1 cu. in.=.2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement)

Calculated and Compiled by Geo. H. Thompson

	1 9/16" x		1 5/8" x		1 11/16" x		1 3/4" x		1 13/16" x		1 7/8" x
1"	443.13	1"	460.85	1"	478.58	1"	496.30	1"	514.03	1"	531.75
2"	886.25	2"	921.70	2"	957.15	2"	992.60	2"	1028.05	2"	1063.50
3"	1329.38	3"	1382.55	3"	1435.73	3"	1488.90	3"	1542.08	3"	1595.25
4"	1772.50	4"	1843.40	4"	1914.30	4"	1985.20	4"	2056.10	4"	2127.00
5"	2215.63	5"	2304.25	5"	2392.88	5"	2481.50	5"	2570.13	5"	2658.75
6"	2658.75	6"	2765.10	6"	2871.45	6"	2977.80	6"	3084.15	6"	3190.50
7"	3101.88	7"	3225.95	7"	3350.03	7"	3474.10	7"	3598.18	7"	3722.25
8"	3545.00	8"	3686.80	8"	3828.60	8"	3970.40	8"	4112.20	8"	4254.00
9"	3988.13	9"	4147.65	9"	4307.18	9"	4466.70	9"	4626.23	9"	4785.75
10"	4431.25	10"	4608.50	10"	4785.75	10"	4963.00	10"	5140.25	10"	5317.50
11"	4874.38	11"	5069.35	11"	5264.33	11"	5459.30	11"	5654.28	11"	5849.25
12"	5317.50	12"	5530.20	12"	5742.90	12"	5955.60	12"	6168.30	12"	6381.00
1/16"	27.70	1/16"	28.80	1/16"	29.92	1/16"	31.02	1/16"	32.13	1/16"	33.23
1/8"	55.40	1/8"	57.61	1/8"	59.83	1/8"	62.04	1/8"	64.26	1/8"	66.47
3/16"	83.09	3/16"	86.41	3/16"	89.74	3/16"	93.06	3/16"	96.38	3/16"	99.70
1/4"	110.78	1/4"	115.21	1/4"	119.64	1/4"	124.08	1/4"	128.51	1/4"	132.94
5/16"	138.48	5/16"	144.02	5/16"	149.56	5/16"	155.09	5/16"	160.63	5/16"	166.17
3/8"	166.18	3/8"	172.82	3/8"	179.47	3/8"	186.11	3/8"	192.76	3/8"	199.41
7/16"	193.87	7/16"	201.62	7/16"	209.38	7/16"	217.13	7/16"	224.89	7/16"	232.64
1/2"	221.56	1/2"	230.43	1/2"	239.29	1/2"	248.15	1/2"	257.01	1/2"	265.88
9/16"	249.26	9/16"	259.23	9/16"	269.20	9/16"	279.17	9/16"	289.14	9/16"	299.11
5/8"	276.95	5/8"	288.03	5/8"	299.11	5/8"	310.19	5/8"	321.27	5/8"	332.34
11/16"	304.65	11/16"	316.83	11/16"	329.02	11/16"	341.21	11/16"	353.39	11/16"	365.58
3/4"	332.34	3/4"	345.64	3/4"	358.93	3/4"	372.23	3/4"	385.52	3/4"	398.81
13/16"	360.04	13/16"	374.44	13/16"	388.84	13/16"	403.24	13/16"	417.65	13/16"	432.05
7/8"	387.73	7/8"	403.24	7/8"	418.75	7/8"	434.26	7/8"	449.77	7/8"	465.28
15/16"	415.43	15/16"	432.05	15/16"	448.66	15/16"	465.28	15/16"	481.90	15/16"	498.52

[1]Based on a steel of 1 cu. in.=.2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement)

Calculated and Compiled by Geo. H. Thompson

	1 15/16" x		2" x		2 1/16" x		2 1/8" x		2 3/16" x		2 1/4" x
1"	549.48	1"	567.20	1"	584.93	1"	602.65	1"	620.38	1"	638.10
2"	1098.95	2"	1134.40	2"	1169.85	2"	1205.30	2"	1240.75	2"	1276.20
3"	1648.43	3"	1701.60	3"	1754.78	3"	1807.95	3"	1861.13	3"	1914.30
4"	2197.90	4"	2268.80	4"	2339.70	4"	2410.60	4"	2481.50	4"	2552.40
5"	2747.38	5"	2836.00	5"	2924.63	5"	3013.25	5"	3101.88	5"	3190.50
6"	3296.85	6"	3403.20	6"	3509.55	6"	3615.90	6"	3722.25	6"	3828.60
7"	3846.33	7"	3970.40	7"	4094.48	7"	4218.55	7"	4342.63	7"	4466.70
8"	4395.80	8"	4537.60	8"	4679.40	8"	4821.20	8"	4963.00	8"	5104.80
9"	4945.28	9"	5104.80	9"	5264.33	9"	5423.85	9"	5583.38	9"	5742.90
10"	5494.75	10"	5672.00	10"	5849.25	10"	6026.50	10"	6203.75	10"	6381.00
11"	6044.23	11"	6239.20	11"	6434.18	11"	6629.15	11"	6824.13	11"	7019.10
12"	6593.70	12"	6806.40	12"	7019.10	12"	7231.80	12"	7444.50	12"	7657.20
1/16"	34.35	1/16"	35.45	1/16"	36.56	1/16"	37.67	1/16"	38.77	1/16"	39.88
1/8"	68.69	1/8"	70.90	1/8"	73.12	1/8"	75.33	1/8"	77.55	1/8"	79.76
3/16"	103.03	3/16"	106.35	3/16"	109.67	3/16"	113.00	3/16"	116.32	3/16"	119.64
1/4"	137.37	1/4"	141.80	1/4"	146.23	1/4"	150.66	1/4"	155.09	1/4"	159.53
5/16"	171.71	5/16"	177.25	5/16"	182.79	5/16"	188.33	5/16"	193.87	5/16"	199.41
3/8"	206.06	3/8"	212.70	3/8"	219.35	3/8"	225.99	3/8"	232.64	3/8"	239.29
7/16"	240.40	7/16"	248.15	7/16"	255.90	7/16"	263.66	7/16"	271.41	7/16"	279.17
1/2"	274.74	1/2"	283.60	1/2"	292.46	1/2"	301.33	1/2"	310.19	1/2"	319.05
9/16"	309.08	9/16"	319.05	9/16"	329.02	9/16"	338.99	9/16"	348.96	9/16"	358.93
5/8"	343.42	5/8"	354.50	5/8"	365.58	5/8"	376.66	5/8"	387.73	5/8"	398.81
11/16"	377.76	11/16"	389.95	11/16"	402.14	11/16"	414.32	11/16"	426.51	11/16"	438.69
3/4"	412.11	3/4"	425.40	3/4"	438.69	3/4"	451.99	3/4"	465.28	3/4"	478.58
13/16"	446.45	13/16"	460.85	13/16"	475.25	13/16"	489.65	13/16"	504.05	13/16"	518.46
7/8"	480.79	7/8"	496.30	7/8"	511.81	7/8"	527.32	7/8"	542.83	7/8"	558.34
15/16"	515.13	15/16"	531.75	15/16"	548.37	15/16"	564.98	15/16"	581.60	15/16"	598.22

[1]Based on a steel of 1 cu. in.=.2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

THREE DIMENSIONAL DRAWINGS

by L. S. Sanders, Pres.
THE CRAFTINT MFG. CO.
Cleveland, Ohio

In order to maintain the tempo of high speed war production it is an obvious fact that every step in the manufacturing process must be geared to the highest efficiency, and that none of the production steps be permitted to create a bottleneck which would slow the entire program.

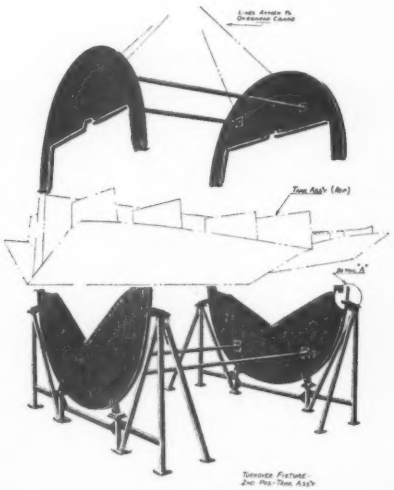
The tremendous volume of war materials which American Industry has produced during the past two and one half years is due to many factors, most important of which has been our skill and experience in mass manufacturing. From start to finish the record has been one of extraordinary accomplishments in the shortest possible period of time.

Before any product can begin coming off the assembly line, there are many preliminary steps. Frequently the designing, and building of the tools, dies and fixtures require not only human skill of the highest order, but also the expenditure of a great amount of time. Therefore any short cut which will speed up this preliminary work helps to bring "V-Day" just that much nearer.

The first step in manufacture is the conception of an idea. Then comes design. Then comes the planning and building of the tools, dies and jigs for efficient and accurate manufacture. Not infrequently remarkable ingenuity is displayed in their development. Drawings are required throughout this planning and building, ranging from preliminary sketches to sometimes highly complicated orthographic projections. Such drawings require the expenditure of time and a high degree of technical skill. To save time here is vitally important.

Profiting from the experience of the aircraft industry, many tool and die makers are turning to the three-dimensional perspective drawing as a quick and simple method of making preliminaries. The result has been a speed up in getting "O.K.'s" by cutting down the time lag which usually occurs when getting ideas down on paper.

Perspectives, both freehand and mechanical, long have been used by artists, architects and mechanical draftsmen for the good and simple reason that they show an object just as it is seen by the eye. However, until comparatively recently, the making of such drawings, due to the necessary hand shading, has been a long and laborious process in addition to requiring skill of a high order.



It remained for the aircraft industry, in its frenzy to attain large production in the shortest possible time, to turn to

the three-dimensional drawing as the answer to many of its design and production problems. The great popularity of this type of drawing has been made possible through the use of a patented drawing paper which makes hand shading unnecessary. The shading is processed in the paper, and is made visible only by the application of special developers.

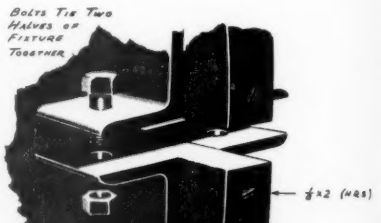
In manufacturing plants which do a great deal of assembling, using parts or sub-assemblies secured from outside sources, it is necessary that there be complete interchangeability of the parts coming to the final assembly lines. To secure this interchangeability acceptance gages are frequently used, and it is necessary that the sub-contractors personnel be instructed in their proper use. For such instruction three-dimensional illustrations furnish the simplest and speediest method of conveying the correct information.

The three-dimensional drawing, in the Tool and Die Industry, is especially valuable in preliminary sketches which are made for discussion and approval. They show the proposed tool, die or fixture in full depth and shape, making it quickly understandable even to the comparatively inexperienced.

In the design of acceptance gages, jigs and fixtures the three-dimensional is valuable for conveying the thoughts of the Tool Planning Engineer to the Tool Designer. The ease and speed with which such drawings can now be made, using the special drawing paper referred to above, makes their use both practical and desirable.

S. J. DeMarco, of the Tool Design Department of the Glenn L. Martin Company, Baltimore, employs the three-dimensional drawings for preliminary tool designs. Mr. DeMarco states that, "after a study has been made to determine location points, accessibility and the type of fixture desired, rough sketches are made to clear up any uncertainties. Then the proposed design is made on ordinary vellum. As the work progresses, reference to the part may reveal details which are questionable. A projected drawing of this part and the application of the part will enable the designer to clear up the point." The accompanying illustrations convey the value of an enlarged view of a detail.

"When the basic design has been approved by the Planning and Design Engineers, it is transferred to Craftint Vellum. Prints are made and included with a write-up of primary manufacturing and assembly procedure. This information is then sent to the design groups for layout and details. It is here that a considerable portion of design time is saved for the basic fixture geometry, working heights, scaffolding levels and locating points are definitely established and clearly illustrated."



Typical Detail "A"

There is still another reason why the use of three-dimensionals has helped to speed the war effort. It has helped to relieve the scarcity of skilled draftsmen. Good commercial artists, architects, teachers, and, in some instances, portrait painters with national reputations, are engaged in making three-dimensionals that measure up to the high standards of the tool and die industry. People with such a diversity of backgrounds, would, if given a free hand, produce a great variety of techniques. However, by using the patented drawing paper previously mentioned, either vellum or board, a uniform appearance is given to the drawings. While there is a great variety of shading patterns available, drafting rooms usually use one type of paper in order to produce the required uniformity.

FRANKFORD ARSENAL ESTABLISHES GAGE ACCEPTANCE CLINIC

Meeting the extreme urgency for critical inspection gages is like feeding a monster that cannot be satisfied. A neck-and-neck race is being run between training new personnel required to check gages, and the huge draft funnel through which gage-checking skill is being siphoned off into the armed forces. The increasing problems resulting from newly trained gage checkers had been reflected in a higher rate of gage rejections. Gage manufacturers who found themselves in relatively the same position with reference to declining curves of efficiency and skill, helped multiply the problem of gage inspection in the Gage Laboratory at Frankford Arsenal.

Acceptance or rejection of gages critically needed on the inspection line assumes significant importance when the decision to accept or reject involves an accuracy of one ten-thousandths of an inch or less.

Numerous gremlins creep in to plague the gage inspector. The story is told about the delicate measuring machine that went out of adjustment regularly every afternoon at 1400 hours (2:00 P.M.). Gremlins seemed the only answer to this irritating phenomenon. A painstaking search revealed that at about that time each day a sunbeam shone down on the instrument through a pinhole in a blacked-out window-pane. Notwithstanding the air-conditioned room, the heat of that tiny sunbeam expanded the measuring machine enough to throw it off.

One of the objectives of the Frankford Arsenal Gage Laboratory is to supply Government inspectors with gages that will insure acceptance of equipment and matériel that will function. It is to be noted that the emphasis on the responsibilities of the Laboratory is to accept gages within the limitations of the above objective. A high gage-rejection rate retards inspection and final acceptance of matériel. Under the impetus of a program 2,000 to 3,000 percent over normal, with the personnel problems referred to above, it is an easy matter to lose sight of the objective. Under such pressure, personnel may easily develop a negative or "rejection" complex. Under this influence, rejections, particularly in borderline cases, may be favored over acceptance.

The realization that this phenomenon was developing in the Laboratory was responsible for the creation of the Gage Acceptance Clinic. This Clinic meets at call by the foreman in charge of the inspection room, not more frequently than once a day. Its duties are to consider all borderline cases before gages are finally rejected. The Gage Acceptance Clinic basically is composed of three top executives of the Gage Laboratory whose experiences aggregate a total of 80 years in the design, manufacture, and inspection of gages. The inspector and his immediate superior present the case to the Clinic. The members meet in the inspection room, where the gages in question, drawings, calculations, and other data are carefully considered.

When problems are discussed while comfortably relaxed in a chair, diffusion of energy results; talk is generally long; results may be short. A feature of the Clinic is that it is known as a "stand-up" Clinic. All members stand up during the sessions. This tends to keep discussion to a minimum and to assure that decisions are quickly reached.

The Clinic operates under the basic principles of gage inspection by the Ordnance Department, as follows:

All gages that would result in the acceptance of defective components will be rejected.

Some gages may be accepted that would reject a few components which are near the component limits, but are nevertheless acceptable. However, where such a gage is accepted, the deviation will be noted on the gage-record card, in

order that the inspector using the gage may resort to the use of measuring equipment if the borderline defect in the gage is operating to reject acceptable components.

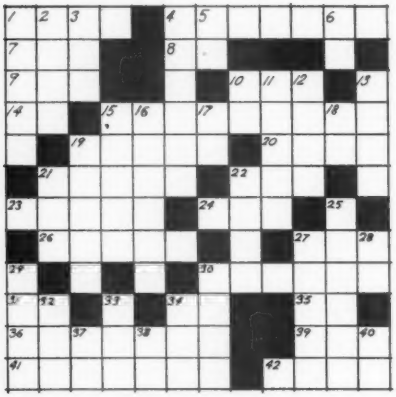
The Clinic insures that proper consideration is given to the limitations of accuracy, of equipment, and of personnel, which factors are inherent in the measuring of every gage. The gage which is outside of the gage-drawing limits, by an amount equal to the available measuring accuracy, is accepted.

The Clinic authorizes simple corrections which can be made in the small salvage shop at the Laboratory where the urgency justifies such action, or where the cost of the correction would be less than the cost of rehandling and reinspection after the rejection.

The several months during which the Clinic has operated have demonstrated that it has fulfilled a valuable purpose in the prosecution of the war. Its operations have been a definite encouragement to the gage industry. When a gage facility has gone all-out in its efforts to meet the requirements of the Ordnance gage drawing, rejection of their work is disheartening to their personnel. The Clinic's assistance in this respect is a morale builder. Critical gages have been placed in the hands of Ordnance inspectors many months sooner than if borderline rejections had been made.

Contractors producing gages for Ordnance recognize their responsibility to present only usable gages and are exercising more care in their own inspection. Considerable expense, valuable machine tool capacity, and inspection hours are thus being saved by this cooperation between Industry and Ordnance through the operation of the Clinic.

For Lunchtime, a TDJ Crossword:



HORIZONTAL

1 California gage manufacturer
4 Chicago manufacturer motor drives
7 Frozen water
8 Horse-power (Abbr.)
9 Former governmental agency
10 Army Post Office (Abbr.)
14 Company (Abbr.)
15 A Cleveland contract tool & die shop
19 Inhabitants of the Netherlands
20 Ferrous metal
21 A Cleveland stamping and machine works
22 Answer (Abbr.)
23 Stamford, Conn., gage company
24 To play a part
26 Drill manufacturer (also a color)
27 Tool & Die Journal circulation plan
30 High male voices
31 A bone
34 To perform an act
35 Syllable for a musical note
36 Manufacturer of collet chucks, California
39 Doctor of Dental Surgery (Abbr.)
41 Precedes production
42 One who uses

VERTICAL

1 Detroit precision tool manufacturer
2 Chicago manufacturer of needle eye laps
3 Girl's name
4 Place of worship
5 From lower to higher
6 Article adjective
10 Part of verb "to be"
11 Sharp end
12 Pertaining to us
13 Extinct volcano in Italy
15 Curtain material
16 To assault
17 Exclamation of pleasure
18 Negative
19 Die set manufacturer
21 Man's nickname
22 Chicago drill bushing manufacturer
25 To wear away
27 Respiratory disorders
28 Part of verb "to be"
29 Water craft
30 A secret society of Chinese
32 Road sign to slacken speed
33 Nothing
34 Man's name
37 Behold
38 Spanish word for "yes"
40 Elder (Abbr.)

INDUSTRIAL PLASTICS

Estimating Plastic Molds

A TIME ESTIMATE FOR A COMPRESSION MOLD

Part IV

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In the development of a method of estimating plastics molds, a complete injection mold has been estimated and tables of time values have been presented. Most of the time elements involved in estimating molds were discussed in connection with the injection mold estimate, but it is difficult to cover exceptions and extrapolations in discussing a single mold. For this reason, a compression mold has been selected to show a further example of time estimating and to emphasize further the applications for the tables of time values.

As it was pointed out at the beginning of the series of estimating articles, the time tables are presented as a general guide. Much is left to the judgment and experience of the estimator, who will be able to improve the accuracy of his estimates by the use of the system and by checking his estimates against the actual times required for the various jobs.

The mold which is selected for estimating is a four cavity compression mold for an escutcheon plate. The part, shown in Fig. 18, has been especially designed to illustrate a maximum number of estimating principles. The raised design on the curved face has no significance, and it is probably not decorative. But it is an element of the mold which is adapted to hobbing. The four pins which project from the rear face serve as mounting or fastening means. They are made small in diameter and with a minimum fillet to avoid shrinkage marks on the face of the part. It is possible that the molder still will have a problem to avoid sunken spots on the face of the escutcheon, but molders often have such problems which are necessitated by the wishes of the buyer, or by unavoidable design requirements.

The escutcheon is to be made of a thermosetting material, partly because it justifies the use of a compression type mold for an estimating example. Other reasons which could apply are that rigidity is required, or good resistance to furniture polish solvents is needed as this part is to be used on a cabinet of good quality.

The semi-positive type mold for the escutcheon is shown in Fig. 19. The four mounting studs are used as ejector locations. The knockout assembly is lo-

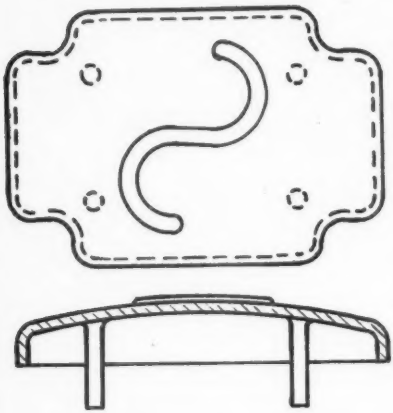


Fig. 18—The escutcheon plate shown in elevation and plan views.

cated above the top steam plate. The steam plate layout is shown in Fig. 20, and the knockout assembly is shown in Fig. 21.

After the mold cavity layout is completed, the hob should be designed. In this case, the material well portion of the cavity is to be formed by the hob. It may not always be good practice to do this, but in this case the total depth of the cavity is not great and the outline of the material well would require extensive milling if it were left to be machined. If accuracy of the molding portion of the cavity can be maintained by hobbing, surely the material well can be held closely enough to dimensions, too. Fig. 22 shows the hob design.

The estimate for the hob may be considered first. The specifications are not given in detail on the drawing. For this reason some of the more important specifications are outlined before the estimate

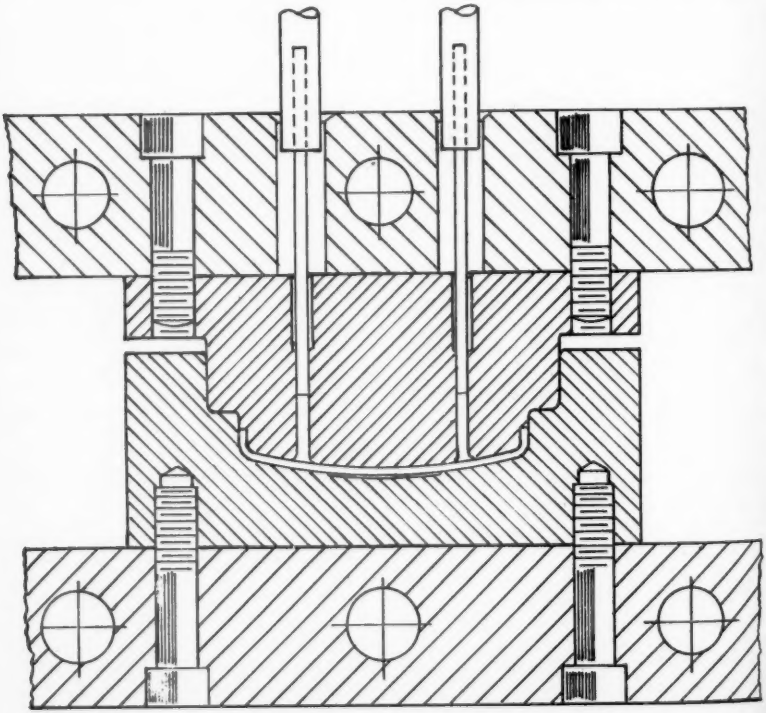


Fig. 19—The semi-positive mold for the escutcheon plate.

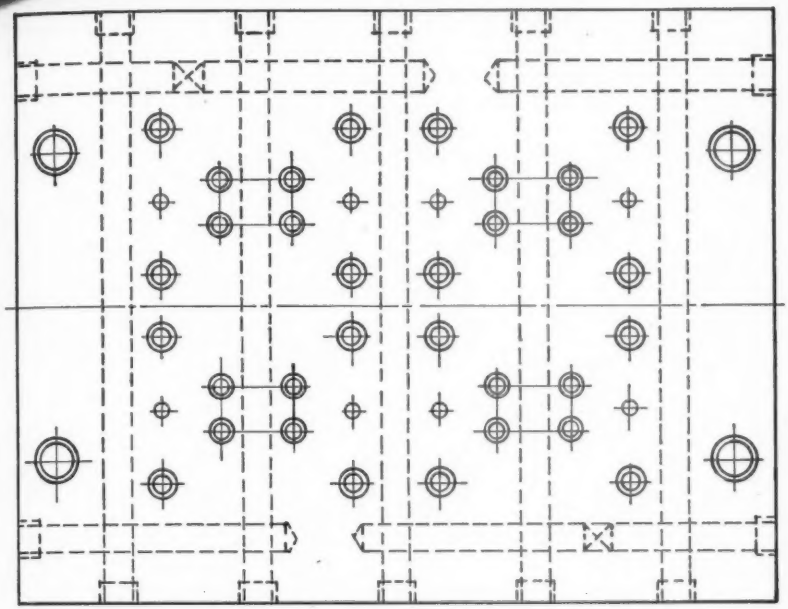


Fig. 20—The top steam plate layout for the four cavity mold. The bottom steam plate is similar except for the knockout pin holes.

is begun:

Material—High speed steel (not as freely machinable as alloy mold steel).

Heat Treatment—Preheat slowly, oil quench, draw.

Tolerances—Plus or minus .001".

Stock size—2" x 2½" x 3¼".

Finish—High polish. (This type of steel may require much work to produce the finish required because of the extensive heating and the nature of the steel.)

The above general specifications are given because they have a bearing on the time estimate. Other details such as dimensions are not shown in order to avoid confusing the minute details with the estimate.

Cavity Estimate

The cavity estimate is the next item on the list of parts. As in the case of the hob, a few general specifications should be outlined before proceeding with the estimate. The hobbing blank should be larger than the finished cavity and it should be prepared to fit a tapered hobbing chase.[1] The most convenient and strongest design of hobbing chase has a circular hole, tapered at approximately 3° so that as a round hobbing blank is forced into it, the taper forces the hobbed metal to flow inward and upward against the sides of the hob. The specifications of the hobbed cavity block are as follows:

Material—Special hobbing grade plain carbon steel.

Finished size—3¼" x 4" x 1½" high.

Hobbing blank—5" dia. x 3" high.

Heat Treatment—Pack carburize, harden and draw.

Finish—High polish on molding portions.

The hobbing operation is one which is almost always special. The most experienced hobbing operator must treat each job as an individual one. It is difficult

[1]Refer to page 92 of "Plastics Molds—Design, Construction, Use" for a discussion of hobbing, and a hobbing diagram.

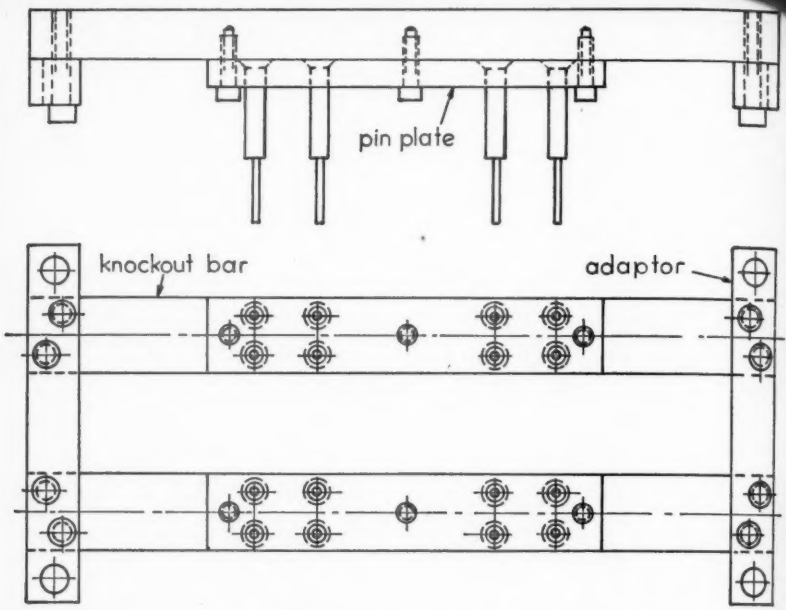


Fig. 21—The knockout assembly. Knockout pins of standard drill rods are made in two parts, furnace brazed together to obtain rigidity and avoid machining long pins of small diameter.

to tabulate data for time values for this reason. The usual preparation time is approximately a quarter-hour for jobs which may be done with hobbing chases and blocking which is at hand. If the hobber has to search for extra blocks or supports to hold the hob in position, time costs can be very high. If all goes well, a hob of ordinary simplicity can be sunk and removed in half an hour. Hobs often stick tightly in the metal and then it may take as long as half a day to remove them. For this estimate, however, it will be assumed that no such difficulties will occur. It is to be hoped, also, that the hob will not break before the four cavity sinkings are made. This does occur often enough to cause the hob sinker to take his job very seriously.

Force Estimate

The next part on the estimate list is the force, shown in Fig. 19. The force is to be made of a block of oil hardening mold steel 3¼" x 4" x 1½" high. It is to be hardened, drawn, and highly pol-

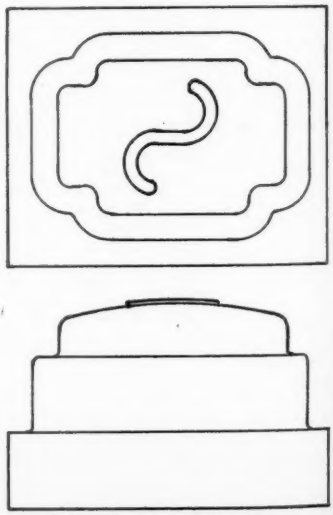


Fig. 22—The hob design

HOB ESTIMATE

Cut off stock	2″ x 2½″ bar (Fig. 2) add 50% for H.S. Steel	.2 hr. .1 hr.
Mill six sides square	Nearest equivalent size 2″ x 3″ x 3″ (Fig. 7) .6 hr. x 120%	.7 hr.
Layout (See Fig. 9)	Straight lines Radii over ¼″ Face radius Inspection time (Fig. 10)	1.0 hr. 1.2 hr. .2 hr. .5 hr.
Mill material well contour (See Fig. 15)	Contour units, 12 Depth of cut, 1¼″ Area removed, 4 sq. in. Tolerance ±.001″ Table value add 200% for 12 contour units add 100% for tolerances add 20% for tough steel	2.4 hr. 4.8 hr. 2.4 hr. .5 hr.
Mill cavity contour (See Fig. 15)	Contour units, 13 Depth of cut, ¾″ Area removed, 2 sq. in. Tolerance, ±.001″ Table value Add 300% for 13 contour units Add 100% for tolerances Add 20% for tough steel	1.0 hr. 3.0 hr. 1.0 hr. .1 hr.
Mill top contour over raised design (See Fig. 15)	Contour units,2—table value x 50% Depth of cut, ¼″ Area removed, 3 sq. in. Tolerance, ±.001″—add 100% Add 20% for tough steel	.4 hr. .4 hr. .1 hr.
Mill top contour below raised design (See Fig. 15)	Contour units, 10 Depth of cut, .010″ Area removed, 3 sq. in. Tolerance, ±.001″ Table value Add 200% for 10 contour units Add 100% for tolerances Add 20% for tough steel	.6 hr. 1.2 hr. .6 hr. .1 hr.

ESTIMATING PLASTICS MOLDS

Finish corner radii and check contour before hardening	Corner radii filed by hand, same as polishing—6 linear inches at .4 hr. per inch Add 100% for gaging File curved top Clean up raised design	2.4 hr. 2.4 hr. 1.5 hr. .8 hr.
Harden (See Fig. 5)	Allow double time to harden H. S. Steel Draw	.4 hr. .2 hr
Polish (See Fig. 6)	19 sq. in. flat area at .2 hr. 24 lin. in. corners at .2 hr. Hand polish raised design	3.8 hr. 4.8 hr. 2.0 hr.
Total Estimated Time for Hob		40.8 hr.

ished. The contours must be accurately machined to match the hobbed cavity.

Steam Plate Estimate

The next estimates are for the steam plates. The top steam plate differs from the bottom one only in that it has 16

HOBBED CAVITY ESTIMATE

Cut off stock	5″ dia. x 3″ long. (Fig. 2)	.2 hr.
Turn taper sides Polish top face	5″ dia. x 3″ long, 48 sq. in. ⅛″ depth of cut. (Fig. 3) 4 sq. in. at .3 hr. each. (Fig. 6)	3.1 hr. 1.2 hr.
Sink hob	(See discussion below) set up sinking	.3 hr. .5 hr.
Machine outside dimensions (See Fig. 15)	Facing—5″ dia. x 1⅗″ deep—19.6 sq. in. x 1⅗″. Table value 12.8 hr. multiply by 50% for 2 contour units. and by 70% for soft steel machine four sides	4.5 hr. 4.5 hr.
Drill and tap for mounting screws and dowels (See Fig. 14)	Four ⅜″ screw Two ¼″ dowels Set up time Layout holes 5 contour units	.4 hr .2 hr .1 hr. .5 hr.
Heat treat (See Fig. 5)	Pack carburize .2 hr. x 200% for packing Harden and draw (two heats)	.4 hr. .4 hr.
Polish	6 sq. in. at .3 hr. Radii at .3 hr. per corner Bottom corner radius, 7 lin. in. Sunken design	1.8 hr. 1.2 hr. 1.4 hr. 1.0 hr.
Grind top and bottom faces (See Fig. 7, directions page 136 Sept. issue)	2 set ups Surface grind two faces	.2 hr. .4 hr.
Total Estimated Time per Cavity Block		22.3 hr.

FORCE ESTIMATE

Cut off stock	4″ x 4″ x 1⅗″ long. (Fig. 2)	.2 hr.
Square 6 sides	4″ x 4″ x 1⅗″ to 3¼″ x 4″ x 1⅗″ (Fig. 7)	.6 hr.
Layout	Hob layout time Add for holes, 8 units (Fig. 9)	2.9 hr. .8 hr.
Mill Material well contour	Same as hob estimate except omit 20% allowance for steel	9.6 hr.
Mill contour for inside of molding	Same as hob estimate except omit 20% allowance for steel	5.0 hr.
Mill curved face	Same as hob estimate	.8 hr.
Hand finish corner radii	Same as hob estimate	7.1 hr.
Mill-bore ejector pin holes (See Fig. 14)	Four ⅜″ holes Counter bore & chamfer back side Mill radius on front face	.4 hr. .4 hr. .4 hr.
Drill and tap (See Fig. 14)	Four holes ⅜″ tap Two holes ¼″ dowel	.4 hr. .2 hr.
Harden	(Fig. 5) Harden Draw	.2 hr. .2 hr.
Polish	Same as hob estimate	10.6 hr.
Grind back face for correct height (See Fig. 7, directions page 136 Sept. issue)	Set up Surface grind one face	.2 hr. .2 hr.
Total Estimated Time per Force		40.2 hr.

knockout pin holes, so the itemization will be made for the top steam plate only. Then the estimate for the bottom steam plate may be obtained easily by subtracting the time for laying out and drilling the knockout pin holes. The top steam plate layout is shown in Fig. 20. The plate is 1½" thick by 10" wide by 13" long. The material is cold rolled steel which does not have to be surfaced.

TOP STEAM PLATE ESTIMATE

Cut off stock	Set up Depth of cut, 10"	.1 hr. .4 hr.
Layout (See Fig. 9)	Steam lines 19 units Guide pins 4 units Mounting screws and dowels 10 units Knockout pins 8 units Inspection time	1.9 hr. .4 hr. 1.0 hr. .8 hr. .8 hr.
Drilling and tapping steam lines (See Fig. 14)	5 holes 1⅛" dia. x 5" deep from both ends equals 10 holes. 400% of table value or .4 hr. each 2 holes 7" deep 500% of table value 2 holes 5" deep 14 holes drill and pipe tap ½" 2 plugs in lateral holes	4.0 hr. 1.0 hr. .8 hr. 2.8 hr. 1.0 hr.
Drilling mounting screw holes and dowel holes (See Fig. 14)	16 holes ⅞" drill and ctbr. 8 holes ¼" drill and ream	1.6 hr. .8 hr.
Drill and csk. for knockout pin holes	16 holes ⅜" dia. (Fig. 14)	1.6 hr.
Total Estimated Time for Top Steam Plate		19.0 hr

Bottom Steam Plate Estimate

The operations which do not occur in making the bottom steam plate are as follows:

Layout knockout pin holes ...	.8 hr.
Drill and Csk. knockout pin holes	1.6 hr.
Total	2.4 hr.
Estimated time for top steam plate	19.0 hr.
Estimated time for bottom plate	16.6 hr.

gether so the estimate for this work is separate from the individual plate estimates. The four holes are 1½" dia. by 3" deep. Table 14 shows .4 hr. each to mill-bore this size hole, so there will be 1.6 hr. for the four holes.

Knockout Assembly Estimate

The knockout assembly is shown in Fig. 21. Its estimate is as follows:

Boring the guide pin holes should be done with the steam plates clamped to-

KNOCKOUT ASSEMBLY ESTIMATE

Cut off stock (See Fig. 2)	2 knockout bars 1½"x1" 2 pin plates ½" x 1½" 2 adaptor bars 1" x 1" 32 pins, 16 of each size	.2 hr. .2 hr. .2 hr. .8 hr.
Layout (See Fig. 9)	8 assembly screws 4 holes in adaptor bar 16 pin holes 6 pin plate screw holes	.8 hr. .4 hr. .8 hr. .3 hr.
Drilling and tapping (See Fig. 14)	4 adaptor bar holes ⅞" dia. 8 assembly screw holes ⅜" dia. 16 pin holes ⅜" dia. 6 pin plate screw holes	.8 hr. 1.6 hr. 1.6 hr. 1.2 hr.
Drill large pins (See Fig. 14)	16 holes ⅞" dia. x 1¼"	1.6 hr.
Furnace braze assembly pins	16 pins at .1 hr. each	1.6 hr.
Peen head pins (See Fig. 17)	16 pins ⅜" dia.	3.2 hr.
Harden pins (See Fig. 5)	16 pins	1.6 hr.
Total Estimated Time for Knockout Assembly		16.9 hr

In this case, the estimate for the assembly is carried in one tabulation to illustrate a time-saving method of estimating and a more convenient arrangement of the figures so that the assembly is estimated all in one place. The knockout pins are made of two pieces, furnace brazed together. Thus rigidity is obtained without encountering the difficulty of machining long pins of small diameter. Standard size drill rod is used for both sizes.

Now all of the mold parts have been estimated except the guide pins. These may be purchased from warehouse stocks, and there is no need to estimate them in the time estimates. They will appear on the material costs estimate.

A summary of the estimate may now be tabulated as follows:

SUMMARY OF TIME ESTIMATE FOR COMPRESSION MOLD

Hob	40.8 hr.
Cavities, 4 pc. at 22.3 hr.	89.2 hr.
Forces, 4 pc. at 40.2 hr.	160.8 hr.
Top steam plate	19.0 hr.
Bottom steam plate	16.6 hr.
Boring guide pin holes	1.6 hr.
Knockout assembly	16.9 hr.
Total Estimated Time for the Mold	344.9 hr.

DESIGN OF MOLDED PLASTICS PARTS

CONTOUR DESIGN - PART 3

By Warren V. Prince

CURVATURE, RIBS, AND RADII

Strengthening with Curvature

In molded plastics parts, thin sections that are curved are very much stronger than the same thickness of section designed straight without any curvature.

Thin curved sections or parts must be designed in such a direction as to offer the greatest resistance to any bending force or clamping force. If in doubt on this point, take a piece of paper or thin metal and study the strength characteristics in different directions after it is curved.

When a section is held rigidly at one end and bent downward on the other end, the center (or slightly below the center) tends to remain the same length during bending, while the top side tends to pull apart due to stretching at the same time the underside is compressed. To visualize this, consider the bending of a very thick section; the further apart the two extremities of tension and compression are, the stronger is the piece. In this respect, curvature accomplishes substantially the same strength relation as would be accomplished by a very thick section, yet the quantity of material is much less.

A particularly strong section is one with a spherical radius with the shape of a portion of a hollow ball. This affords maximum strength in all directions.

The different kinds of applied forces are:

Compression
Flexural (bending)
Tension (pull)
Torsion (twist)
Shear (sliding failure of material)

When a plastics part is supported at both ends with a load applied at the middle, it is always better to design the part with an arc, having the crest of the arc at the point of load application. A plastics part of curved design can withstand approximately 3 or 4 times as much load as the same wall thickness designed flat or in a straight line. This is because the *average compressive strength of the average plastics material is about 3 or 4 times greater than its tensile strength.*

An arc between two points obviously is larger than a straight line between the same points. A load applied to a flat wall section tends to force the wall into an arc. This *stretches* the material and sets up tensile stresses throughout. If we begin with an arched wall section held at both ends and try to force it to approach a straight line, we actually force the material together and set up compressive forces throughout rather than tensile.

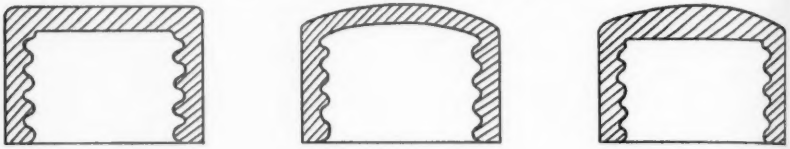
This principle may be illustrated in the design of bottle caps which must receive loads placed on the top of the bottles. Some caps are designed flat across the tops. This is the weakest type of cap. Others are designed domed or arched with uniform wall thickness. In this case about four times the load may be applied before failure occurs. Still other caps are designed arched on top but flat on the underside in the belief that the additional thickness of material adds strength. Actually this design is *weaker* than the thinner uniform thickness arched section because the flat underside tends to stretch into an arc when loaded rather than to compress, and tensile stresses rather than compressive stresses are set up. This arched principle is applied in bridge construction.

The Uses of Ribs

The principal advantages of ribs are:

1. Piece is materially strengthened.
2. Warping is prevented or greatly reduced.
3. Flow characteristics are improved during molding.

Parts with thin sections can be greatly strengthened with the proper use of ribs. Ribs are connecting walls or webs leading from one wall to another. They prevent distortion or deflection of one wall relative to the other, and prevent breakage by rigidly connecting and supporting two or more walls.



a, Weak top design b, Strongest top design c, Less strength than b

Fig. 14—Sketches "a", "b" and "c" illustrate three top or dome design for such parts as closures or caps. In "a" the top design is weak since tensile stresses are set up under load. In "b" the dome or arch resists distortion by the greater compressive strength of the material, making this the strongest design. In "c" the inside greater thickness of the dome stretches under load, setting up tensile stresses rather than compressive stresses.

The thickness of ribs should be approximately equal to the wall thickness of the rest of the molded part. Uniform thicknesses will prevent warpage of the piece as it cools. If the ribs are thinner than the other sections, they will cool and shrink more rapidly, which will draw the other section out of shape and cause warping. If thermosetting materials are used, uneven cure will result when sections are not uniform and warping in this case will be a secondary effect. But even under the most adverse conditions, thermosetting materials will not warp as badly as thermoplastics.

Ribs should have a liberal amount of draft wherever possible. Three to five degrees is recommended. Less draft will have to be used if the rib extends in the direction of the draft for such a distance that wall thickness becomes materially different from top to bottom. If too little draft is used, the ribs will cause a drag during removal of the piece from the cavity.

Too much resistance to ejection may cause the following:

1. Ejection pins or stripper plate may distort the piece during ejection.
2. Ejection pins may sink into piece while forcing it out.
3. Piece may stick to wrong half of mold with no provision for ejection.
4. Scoring of walls will occur if sticking is bad enough.
5. Piece may pull apart as mold is opened or ejection begins.

Thin sections on molded plastics parts have a natural tendency to warp. The thinner the sections, the greater the warping. This is particularly true of thermoplastic materials. In such cases ribs should always be added to support the thin walls so that they cannot warp, or at least keep the warpage within permissible limits.

Another important use of ribs is to improve flow characteristics during molding. Some cavities are difficult to fill under normal conditions. Sometimes the molded pieces may have low physical strength in certain portions of the part due to insufficient pressures in those portions during molding.

In the latter, the pressure required to fill the cavity drops off as the material flows through thin passages or for long distances and becomes almost zero at the extremities of the cavity. This pressure drop permits the piece to harden under low pressure so that proper density of the material in that portion is not achieved. The lower the density, the lower the physical strength of the part.

Quite a good deal of difficulty is experienced in filling the cavity with some materials. In such cases ribs can be added which will serve as *shortcuts* for the flow of material. They can serve as feeder channels and "feed" a wall section in many places instead of one. Weld

marks or flow marks will be greatly improved. Density will be increased due to the shorter distance that the material has to travel, which results in less pressure drop. Molded pieces can be produced somewhat more rapidly due to faster closing time or faster injection time required to fill the cavity.

Radii and Fillets

Advantages of designing radii and fillets as compared with square corners on a molded part are as follows:

Outside radius on molded part:

1. Mold is less apt to crack during heat treating.
2. Mold is less apt to crack from molding pressures.
3. Flow characteristics are improved in filling out cavity during molding.
4. The part is less apt to stick in the mold.
5. Corners fill out more easily during molding.
6. Easier for the mold maker to produce.
7. Hobbing of cavity becomes much easier.
8. Mold cavity is easier to clean.
9. Chipping of corners or edges on part is prevented.
10. More pleasant to "feel" or handle.
11. Better appearance.

(Disadvantage):

1. If parting line comes at radius, finishing becomes more difficult.

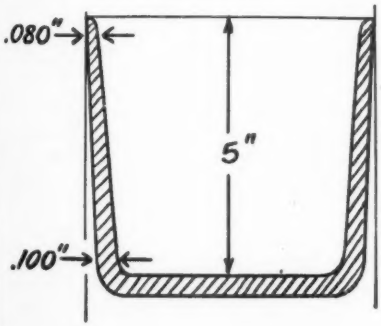


Fig. 16—A representative taper for average wall thickness affords easier filling of the cavity as the ram progresses. It is important that the maximum outside taper be provided to permit good ejection from the cavity.

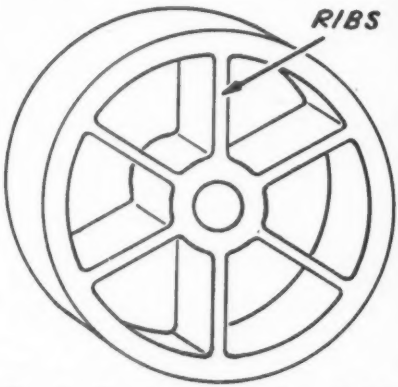


Fig. 15—The rib construction of this caster wheel has the following advantages: (1) the piece is materially strengthened due to uniform density made possible by radial flow; (2) warping is negligible; (3) flow characteristics are improved, resulting in improved weld marks and faster closing and curing time.

Inside radius (or fillets) on a molded part:

1. Part is greatly strengthened and is less apt to break.
2. Mold edges are prevented from accumulating dents and burrs which hamper ejection.
3. Flow characteristics are improved in filling out cavity during molding.
4. Sticking is less likely to occur in mold.
5. Hobbing of cavity becomes much easier.
6. Better appearance.

Perhaps the most serious effect of square corners in the design of a molded plastics part is in the example of an inside square corner at the base of a relatively thin wall section. A crack or break can develop from very light forces in the sharp corner where the stresses are concentrated. Stresses are always highly concentrated at short inside corners. The wall surfaces adjacent to the corners have practically no stress at all in contrast to stresses at the corner.

The addition of a simple radius or fillet in the corner causes the same stresses to be *distributed over the surface of the radius.* The larger the radius the more the distribution of stress

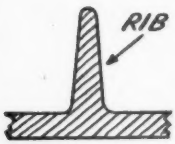


Fig. 17—This section of a rib illustrates the sound design principle that the thickness of a rib should be approximately equal to the wall thickness of the molded part or piece.

and the less is the stress at any one point. Breaking always starts at the point of highest stress concentration and the higher the stress, the sooner the break.

Punching dies for small holes in metal is a good example of the importance of radii in strengthening.

The next most serious trouble from square corners exists in the cavity of the mold where an inside square corner allows high stress concentrations to develop during heat treating, or during application of molding pressure while a part is being molded.

During heat treating for hardening the steel, the mold is first brought to a high predetermined temperature in order to obtain the proper crystalline structure desired in the steel. Then the hot mold is immediately immersed in a quenching liquid in which this mold cools very rapidly in order to "freeze" or set the desired crystalline structure. This rapid cooling during immersion causes tremendous strains to be developed throughout the steel caused by rapid and uneven shrinkage from cooling. Some portions will always cool faster than others and the result is that one portion shrinks while another does not. Such uneven shrinking tends to pull some portion of the mold apart from other portions, and where inside square corners exist the stresses will multiply until they become dangerous. Cracking often results.

Some molds have such shapes that when square corners are present, cracking is inevitable during heat treating regardless of the skill of the operator. On the other hand, these molds may pass heat treatment without cracking, but may eventually crack during application of molding pressures. In such cases a radius or fillet *must* be used in the place of inside square corners before a successful mold is possible.

Many days are spent in the making of an average mold and hundreds, sometimes thousands of dollars are involved, but it takes only a matter of seconds to crack the mold in quenching during heat treatment. Sometimes the fault is in the carelessness of the heat treater, but the designer must *expect* such carelessness occasionally and design accordingly.

Heat treatment always leaves some strains remaining in the mold regardless of the skill of the heat treater. These strains may not be sufficient to crack the mold during heat treating but if they are great enough after heat treating, the pressure induced during molding may add enough strains to crack the mold.

From the standpoint of filling out the cavity during molding, it is much better to have rounded corners where there is flow of material. In other words, the mold cavity should be streamlined for the easy flow of material, as the cavity is filled under pressure.

The reason why this streamlining is of major importance is because the plastics materials during molding are so extremely thick and stiff that they are semi-solid and the slightest obstructions to flow cause a considerable pressure drop in the material. It is pressure that moves the material.

Pressure in straight unobstructed sections normally diminishes at approximately a rate of about the square of the distance traveled. For example, in the case of runners or feed channels in injection molding, if one runner is twice the length of another runner of the same shape and thickness, the pressure at the end of the long runner will be only one fourth of the pressure at the end of the short runner.

Another example is in the compression molding of a cup. If one cup has three times the height of another cup, it will require nearly nine times as much

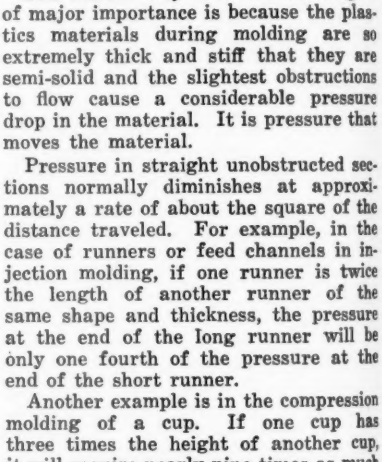
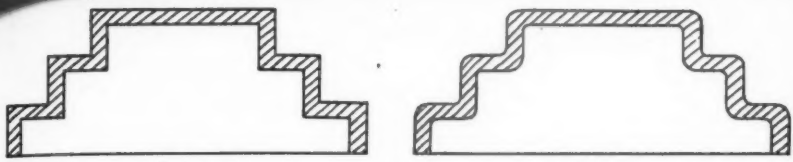


Fig. 18—The correct use of radius and fillet distributes stresses over the surface of the radius, avoiding dangerous stress concentrations.



a, Incorrect b, Correct

Fig. 19—Sharp corners as shown in "a" causes a sharp pressure drop in mold flow. The thinner the walls are, the greater the pressure drop will be. Streamlining the cavity to aid the flow as illustrated in "b" is a fundamental of good design.

pressure to develop the same pressure at the top of the cup as the mold is closed, providing that the wall sections are of the same thicknesses.

This illustrates that pressure problems are bad enough in straight sections without considering making the material turn corners. Sharp corners as in Fig. 19-a cause a very sharp pressure drop. The thinner the walls, the higher the pressure drop. Thick walls have very little pressure drop.

Hence, the rule of pressure diminishing at the rate of the square of the distance is only for the *average* case. The results change very widely with variations in wall thickness.

Another exception to this rule of pressure drop is in the example of molded nylon. Nylon has a very sharp melting point and at molding temperatures it has the viscosity of S.A.E. 20 motor oil and flows freely. Free flowing liquids under pressure have the same pressure throughout. Therefore, with molded nylon the pressure drop is no problem.

With the average plastics materials, owing to their stiffness during molding, it is sometimes difficult to force the material to fill out into square corners. To illustrate this, take a piece of molder's clay and see how hard it is to force it into a square corner as compared to a round corner.

In mold making the tools used in shaping a cavity are rotary cutting tools, or in other cases the mold rotates and the cutting tool is held stationary. Therefore, it is quite difficult to produce a square hole, or to produce a square corner where three walls meet at a corner and are perpendicular to one another (i.e., in the corner of a box). A rotary tool cannot get into such a corner. The only practical way to produce such a square corner is by careful hand-chiseling which is time consuming and costly. Corners with a radius or fillet are much easier to produce in the mold.

Hobbing

Hobbing of a cavity, which is often an easy and inexpensive way of making a cavity, is an operation which requires rounded corners for best results. Hobbing is done by making a replica of the molded plastics part out of hardened tool steel and pressing it under tremendous forces into a soft steel block. The hob leaves its impression in the steel and the impression is the cavity.

In such cases square corners on the hob, particularly at right angles to the downward stroke, will shear and tear the soft steel as the impression is made. The soft steel is actually caused to flow out around the hardened hob under the extremely high pressures. Sharp corners oppose the flow of metal and an imperfect cavity results.

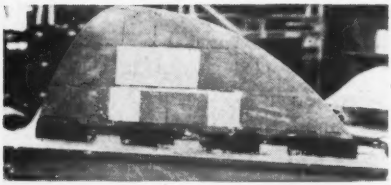
Therefore, a hob should be "streamlined" as much as design will permit with both inside and outside radii for easy flow of metal and good finish in the cavity.

Sharp edges in a mold cavity are subject to being dented occasionally by accident. This may result in a burr. The dent or burr will, of course, be reproduced on every molded piece. When a dent occurs at the edge of any of the side walls, which are parallel to direction of removal of the molded part, the burr projecting from the wall will score the molded part all the way down the side wall during ejection. This ruins the appearance of the molded part and makes removal of the piece very difficult.

A radius on such corners will prevent dents and burrs and eliminate the troubles that go with them.

The next article will be on holes and undercuts in molded plastics parts.

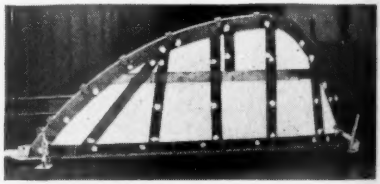
A PLASTIC DRILL JIG FOR ASSEMBLING THE "BALTIMORE" WING TIP



Plastic tooling is making rapid strides at The Glenn L. Martin Company, Baltimore, Maryland. Among the tools already in use are drill jigs, cowling and spot welding fixtures, drill and checking fixtures and hydroform blocks of thermosetting materials (Textolite,[1] Catalin,[2]

Catabond[2] and Durez 7421[3]); and drop hammer and hydraulic die punches and checking fixtures of thermoplastic material (Plastalloy[4] and Plexiglas[5]).

One of the most interesting new developments is the plastic drill jig developed for the A-30 "Baltimore" wing tip. The series of photographs follow the step-by-step procedure in the construction and use of this jig at the Martin plant.



A master form is built out of wood. A plaster cast in two parts is taken from this form. After removal, stiffeners are built up on the surfaces of the molds with plaster of Paris. The two halves of the cast are then lacquered and assembled together.

The casting resin is then poured into the assembly and the mold is cured for 72 hours at 80° C (176° F). After cure the cast is removed from the mold and the base is planed level for the mounting base. After drilling and tapping the jig is mounted on a masonite base. The mounted jig then leaves the mold

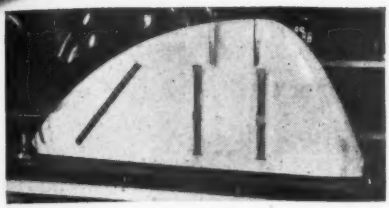
[1]"Texolite" is General Electric's general trade name; approximately 80 formulations of both thermoplastic and thermosetting materials are included for injection, compression, laminating and cold molding.

[2]"Catalin" is the cast phenolic resin made by Catalin Corporation; "Catabond" is a laminating or bonding phenolic liquid resin.

[3]Durez 7421, a casting resin, is a product of Durez Plastics and Chemicals, Inc., North Tonawanda, N. Y.

[4]"Plastalloy" is a liquid casting resin, made by Plastalloy Company, Burbank, Calif.

[5]"Plexiglas" is an acrylic resin available in sheet, rod or as a molding powder, made by Rohm & Haas Co., Washington Square, Philadelphia, Pa.



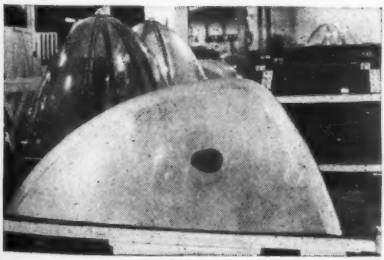
shop for the tool room. Note the recesses for the stiffeners.

In the tool room a drill basket is built around the jig. After an inspection the new jig is ready for use.

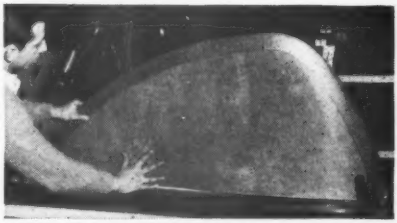
The drill basket is removed and the metal inserts or stiffeners are placed in the recesses provided for them. The stiffeners are attached by masking tape. Then the skin sections are fitted to the side surfaces of the jig by locating pins. The skin conforms to the solid contour of

the fixture eliminating any tendency of the skin to wrinkle or buckle.

After both side skins are in position, the splice angle or edging strip is added. The drill basket is then lowered in place over the assembly and located by pins in the base of the jig. The skins and stiffeners are then drilled and parkered together. The assembly, as shown, is then ready for the final operation—spot-welding.



The plastic tooling program at Martin has shown that important savings in both man hours and critical materials have been made. Overall savings with plastics have been greatest when used for checking fixtures, particularly where it has been possible, as it frequently is, to cast the tool from a model or sample part. In the Martin shops locating fix-



tures have been made, ready to use, in as short a time as 20 hours. Another important advantage has been the ability to mold actual parts quickly when the number of parts needed is limited or deliveries are behind schedule.

Phenopreg

The revised edition of "Phenopreg", a catalog of impregnated laminating materials, has been issued by the Detroit Wax Paper Co., Dept. T, 1721 Pleasant Ave., River Rouge 18, Mich. The term "Phenopreg" includes a variety of base materials, including paper, cloth and fiberglas fabric coated or impregnated with various types of resin varnishes.

Divided into two sections, the first treats of processes and applications. Laminating temperatures and pressures are given for phenol and urea formaldehyde and for melamine resins. The company specializes in the specification treatment of fabrics, sheetings and papers with phenolic resin varnishes. The laboratory control and impregnating technique are outlined.

The second section gives the physical values and specification data on grades of duck, sheeting, tube winding, paper and bonding material furnished by the company. The data should be very useful to the designer of laminated plastic products. A copy of the revised edition of "Phenopreg" will be forwarded on request.

INFORM-A-GRAM KEY NO. B81-R.

MATERIAL CONSERVATION SUSTAINS PRODUCTION

A Story of K. E. M.

BY E. R. PATTERSON

Makalot Corporation

At the onset of active American participation in the war the plastics industry was steadily leaving behind the early conception that plastics were only a substitute for metals and other material. The normal development of the industry had brought its products to the point at which they were becoming recognized as "first choice" materials, i.e., they were selected on the basis that they were the best suited materials for a given application. The war program has greatly accelerated this tendency.

Necessity, says an ancient proverb, is the mother of invention. So many new and difficult problems have been presented to the Plastics materials manufacturer that research has necessarily been greatly accelerated, resulting in faster and better production.

Thermos bottlecaps, stove handles, knobs, bottle and jar closures are molded of a K. E. M. compound.

Conservation of critical materials is always a major problem. Since phenol-formaldehyde compounds are the most commonly used thermosetting molding compounds their conservation is of critical importance. Makalot's new K.E.M., which was the result of diligent research to "KEEP 'EM MOLDING", is one of the examples of what research has achieved under pressure and illustrates the ingenuity of the plastics industry. This thermosetting compound for compression, transfer and jet process molding, with its enormous saving of both phenol and formaldehyde was Makalot's contribution to the challenge of conserving our vital chemicals.

Vital Materials Saved

K. E. M. has saved countless tons of vital phenol and formaldehyde for the war effort. K. E. M. requires only minimum amounts of formaldehyde. The phenol used varies from zero to fifteen percent, depending upon the molding characteristics and the end product use. The material "A" in the table is the basic K. E. M. compound. Materials "B", "C", "D", "E" and "F" represent various Makalot K. E. M. extended materials. Extended materials are those in which the phenolic resin is supplemented or extended with other resin-like binders to yield a greater volume of materials for a given amount of phenol, e.g., 100 lbs. of phenol resin may be compounded with 110 lbs. of filler material to yield 210 lbs. of molding compound. An extended material might be represented by 50 lbs. phenol resin, 50 lbs. K. E. M. resin, 110 lbs. filler to yield 210 lbs. of finished material, thus affecting a saving of 50 percent phenol. The actual savings in both phenol and formaldehyde as compared to "H", which might be considered a representative general purpose compound, are shown in the following chart.

Many articles on the civilian market would be definitely unavailable if K.E.M. was not available for these less critical applications. A few examples are: watch cases, kitchen utensils, photographic equipment, toilet floats, cosmetic closures and containers, cup holders, radio cabinets, ash trays, molded parts of glass coffee makers, calendar and memo pad holders, bottle closures, trays, stereoscopic viewers, church collection plates, and numerous others.

K.E.M. employs, as a basic reactant, a specific type of hard wood distillation residue. This tar-like material is processed to effect the condensation of a thermosetting resinous material and the separation of un-reactive elements.

K.E.M. molding compounds are utilized for molding articles which possess physical properties approaching closely those of standard phenolics. Four standard compounds are available: K.E.M. No. 103 is representative of general purpose materials adaptable for a wide range of applications; K.E.M. No. 105 is a non-bleeding material for use in the manufacture of closures; K.E.M. No. 110 is a mineral filled material with improved water and heat resistance, recommended for heater plugs, ash trays, etc.; and K.E.M. No. 118 which possesses the improved impact strength required on special applications.

HOW K.E.M. SAVES CRITICAL MATERIALS

Material	% Phenol	% Form.	Lbs. Phenol Required for 1000 Lbs. Comp.	Lbs. Form. Required for 1000 Lbs. Comp.	Saving Over G Phenol	Saving Over G Form.	Saving Over H Phenol	Saving Over H Form.	Saving Over I Phenol	Saving Over I Form.	% Form. By Cost
A	0	10	0	100	300	250	350	300	400	360	3.6
B	5	19	50	190	250	160	300	210	350	270	6.9
C	10	24	100	240	200	110	250	160	300	220	8.7
D	15	26	150	260	150	90	200	140	250	200	9.42
E	20	28	200	280	100	70	150	120	200	180	10.9
F	25	30	250	300	50	50	100	100	150	160	11.6
G	30	35	300	350	...	...	50	50	100	110	12.7
H	35	40	350	400	...	...	...	...	50	60	13.
I	40	46	400	460	...	...	...	...	...	...	15.

Material "A" is representative of basic MAKALOT K.E.M. molding material.
Material "G" is representative of extended materials recently allowed by the government for use on civilian closures.
Material "H" is representative of the great majority of general purpose compounds.
Material "I" is representative of the special and superior materials required on many war applications.
Material B—C—D—E and F represent various MAKALOT extended materials.

This cafeteria type tray was molded from a K.E.M. compound containing 15 percent phenol. Designed for the armed services, it is also in use in defense plants and hospitals.

The compounds of K.E.M. take slightly longer to cure than the usual phenolics at temperatures approaching 350° F. Actual production comparisons record 5% to 20% time increase, dependent upon the type of piece and the established curing time. The physical properties are, in general, slightly lower than phenolics in the same class. However, K.E.M. produces very satisfactory finishes and is supplied in a complete flow range. It may be secured in black, brown, or mottled effects of these colors.

Originally offered as a non-priority compound, K.E.M. is now listed as a less critical thermosetting compound because of the shift of formaldehyde to the allocated list. Phenol up to 15% has been permitted in making K.E.M. for products of sufficiently essential end use. K.E.M. when thus enriched with phenol is hardly distinguishable from standard phenolics in both molding performance and final properties. The accompanying table gives the physical test data on general purpose K.E.M. materials.

Thermos bottle caps, stove handles, knobs, and many other articles molded of K.E.M. would have been off the market if this compound had not "Kept 'Em Molding". The beautiful tray for displaying cigarettes, molded for Liggett-Myers Tobacco Co. by the Niagara Insul-Bake Specialty Co. of Albany, New York, weighs 19 ounces and required no phenol and less than 2 ounces of formaldehyde.

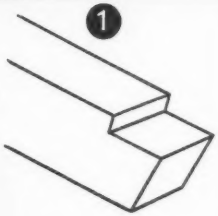
In addition K.E.M. resins have been developed for general bonding use and for laminating wood, paper and textiles. These resins are available in solid form, alcohol solution or water miscible form.

	K.E.M. (no phenol)	K.E.M. (15% phenol)
Specific gravity	1.41	1.41
Specific volume	.50	.55
Tensile strength	5000	5500
Compressive strength	25000	27000
Flexural strength	6000	7000
Impact strength, Izod, ft. lbs./in.	.18	.27
Hardness, Rockwell	M 110	M 110
Softening point	none	none
Dielectric strength, V/M	300 v/m	300 v/m
Water absorption, %, 24 hours	.70	.55
Burning rate	Self extinguishing	Self extinguishing
Effect of age	none	none
Effect of sunlight	none	none
Effect of mild acids	Little to none	none
Effect of mild alkali	surface dulled	
Machining qualities	good	good
Molding qualities	good	excellent
Molding temperature, compression	300-350° F	300-350° F
Molding pressure	2000-3000	2000-3000
Shrinkage, mold, ins/in.	.0070	.0065
Weight in terms of cubic inches or cubic feet	25 gm/cu/in	23 gm/cu/in

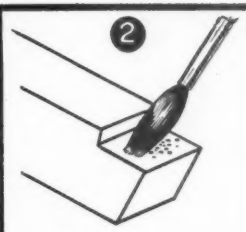
Tips on Tipping

COOPER-BESSEMER MEEHANITE TOOL BODIES

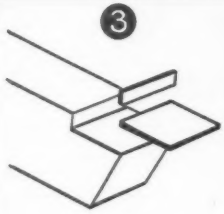
In hundreds of busy war plants, machine shops are saving money and critical tool steel by brazing carbide cutting tips on Cooper-Bessemer Meehanite Tool Bodies. If you are not doing it, the sketches below will show you how simple the operation is:



Mill necessary recesses in Meehanite tool body to suit type of tip.



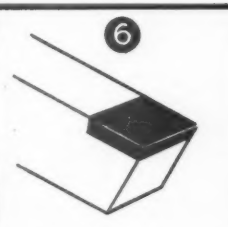
Clean all surfaces to be joined (both recess and tip) with carbon tetrachloride.



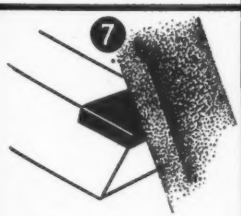
Cut strips of silver solder to conform to sides and bottom of carbide tip.

Coat recess surfaces with flux. Lay silver solder in place, coat lightly with flux. Grind side and edge of tip and lay in place.

Heat tool bottom underneath recess, working up sides, till molten solder flows freely (Temp. 1275-1300° F.). While heating, the tip should be held in place firmly by a steel rod.



To prevent checking, cool tool slowly, burying it in asbestos, mica or lime. Do not cool in water.



Finish grind tool, honing razor edge on tip to .005" radius to prolong tip life.

Meehanite is ideal for tool shanks, milling cutters and forming tools. Furnished by Cooper-Bessemer, they are well-designed, properly balanced and carefully made. They are easy to finish machine. They absorb vibration, eliminate tool chatter. They permit faster cutting because they dissipate heat faster and do not load up so fast. SEND FOR BULLETIN 53-T-2.

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Industrial Tool Division
Dept. J, Mount Vernon, Ohio

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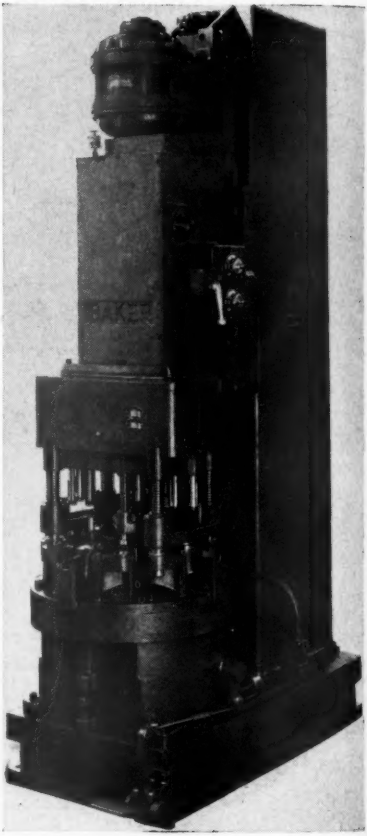
Standard unit designed for high production, with direct coupled motor drive to the spindle, which is speed-geared according to the job specification. For lower production or diversified operation, unit is available with speed change pick-off gears.

Illustrated here is BAKER Hydraulic Feed Unit application as a vertical multiple spindle driller having a hand actuated indexing table.



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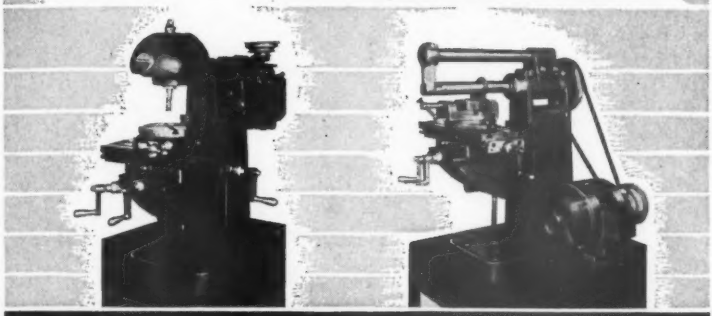
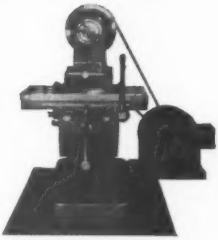


Vertical Mill *Horizontal Mill and Overarm*

FOR PRECISION TOOL WORK OR HIGH-SPEED PRODUCTION



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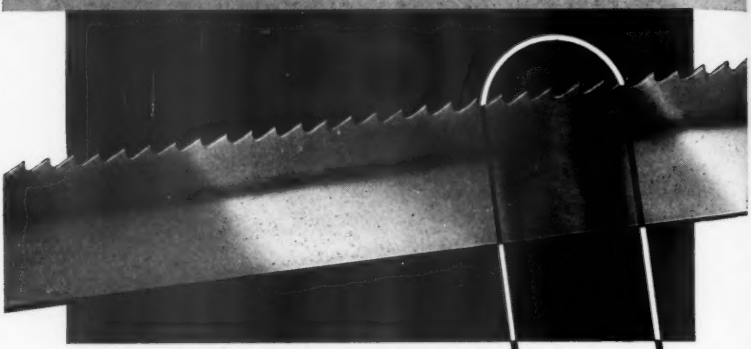

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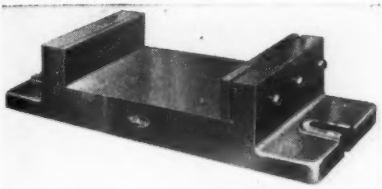
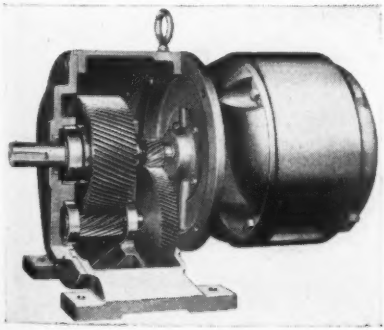
Use our postage-free Inform-a-Gram for your requests.

NEW HOLDING FIXTURE. A new, shop tested, holding fixture to cut down set-up and loading time on milling machines, boring mills, planers, shapers, drill presses, etc., has recently been added to Challenge Machinery Company's well-known line of precision shop equipment. The Challenge Holding Fixture



is made of special analysis, semi-steel with sufficient metal used where needed. It is available in three standard sizes. THE CHALLENGE MACHINERY CO., Dept. J, Grand Haven, Mich., will send a new bulletin on the holding fixture.
INFORM-A-GRAM KEY No. 431-R

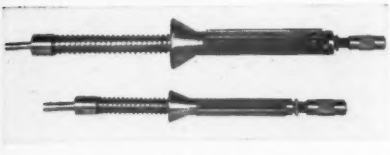
SPEED REDUCERS. The addition of a new type speed reducer to their present line of machine tool drives and speed reducers has recently been announced by the Cullman Wheel Co. of Chicago. The new reducers range in size from ½ to 10 hp with ratios up to 5:1 on the single type and 20:1 on the double type. An unusually large selection of speeds is available when 1200 or 1800 rpm motors are used. Helical pinions and gears supported on ball bearings, all designed to take a liberal overload, are totally enclosed in an oil tight housing. The units are streamlined, compact and sturdy. Write CULLMAN WHEEL CO., Dept. TJ, 1332 Altgeld St., Chicago 14, Ill., for further details.
INFORM-A-GRAM KEY No. 96-R



INDICATOR SNAP GAGE. The Federal Products Corporation of Providence, R. I., have recently developed a Visual Dial Indicator Snap Gage which allows the inspector to see rather than just feel variations in dimensions. This Model 1330-P-100 is equipped with a retractable anvil which is adjustable for work size, making the gage easier to apply and eliminating all excuses for marring the surface of highly finished workpieces. The reference contact is adjustable to any dimension within one inch and locked in place. There is no lost motion. Another feature of the Federal Indicator Snap Gage is that the weight of the gage and the operator's hand rests upon the fixed or reference contact. A light thumb pressure retracts the sensitive contact. A backstop

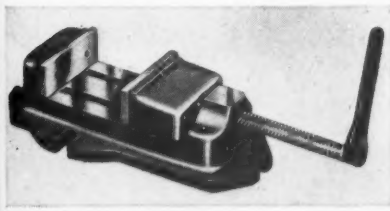
centers the work between the contacts and is adjustable. The Model 1330 P-100 measures 6" at the longest point; it is only ⅝" thick; and weighs only 15 ozs. It reads in tenths (.0001"). Contacts are of hard wearing Norbide. Details on this modern snap gage willl be sent by FEDERAL PRODUCTS CORP., Dept. TD, 1144 Eddy St., Providence, R. I.
INFORM-A-GRAM KEY No. 4-R

THE SMALL BORE HONE manufactured by the Automotive Maintenance Machinery Co. is especially adaptable to piston pin fitting, honing spindle bolt bushings, water pump bushings, steering sector bushings, honing brake cylinders and other small hones. Its outstanding features include an automatic centering cone which maintains perfect alignment and permits grinding each boss separately. A stop collar limits its expansion and permits grinding all holes to the same size. The Ammco Small Bore Hone also features



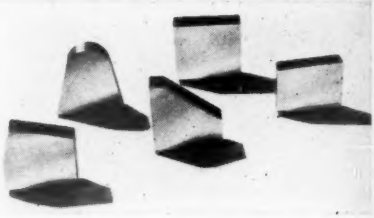
a push expansion knob for expanding the tool to grind to the limit set by the stop nut. The expansion knob may be removed and a nut for expanding the tool substituted. The Ammco hones steel, cast iron, brass, alloy or bronze equally well and will not jam in split bushings. Only two sizes are required to cover a range of $\frac{3}{4}$" to 2½", i.e., No. 1 with a range of $\frac{3}{4}$" to $1\frac{7}{16}$" and PH-200, $1\frac{7}{16}$" to 2½". Detailed information, specifications and prices will be sent by AUTOMOTIVE MAINTENANCE MACHINERY CO., Dept. T, 2100 Commonwealth Ave., North Chicago, Ill.
INFORM-A-GRAM KEY No. 197-R

A HEAVY DUTY VISE of radically new design has been developed by the MECHANICS ENGINEERING CO. of Jackson, Mich. This vise, known as the Jenkins Bar-Lok, is set and released by means of a Bar-Lok push-pull pressure unit, thereby eliminating the winding operation common to threaded bars. It has a



positive locking contact at four points and will develop pressure up to 20,000 pounds. Only a quarter of a turn of the handle is needed to lock and release. The Bar-Lok Vise is precision built for heavy duty, particularly on milling machines and drill presses and wherever severe vibration might affect holding. The vise is built in one size, however the 4" opening is equivalent to any ordinary 6" vise. It is 3½" high with jaws $1\frac{5}{8}$" x 4¼". A circular is available from the manufacturer.
INFORM-A-GRAM KEY No. B59-R

HAYNES STELLITE TOOL TIPS have now been made available for shops desiring to fabricate their own metal-cutting tools by HAYNES STELLITE CO., a Unit of Union Carbide and Carbon Corp., Kokomo, Ind. These are cast from Haynes Stellite cobalt-chromium-tungsten alloy. Metal-cutting tools made by brazing these tips to steel shanks are recommended for jobs employing tools of large cross sections or tools that are bent or offset; also in tool holders which make the use of solid tools impractical. These tool tips provide also

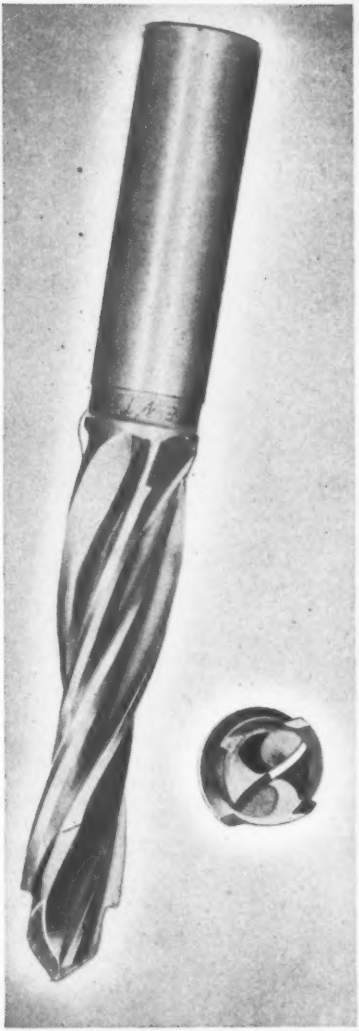


the red-hard, abrasion-resistant cutting edge; and the steel shank to which the tip is brazed provides the strength and toughness necessary to withstand the strain resulting from such operations. Ten standard shapes of tool tips can be furnished, in each of ten standard sizes, cast from either 98M2 or Star J-Metal alloy. Each has the joint faces (bottom and one end) bronze-tinned for brazing. Standard tips can also be furnished without the bronze coating if desired. Stock is allowed on standard tips for finish to nominal size. Complete information is available from the company.
INFORM-A-GRAM KEY No. 313-R

DOUBLE END PISTON MACHINE developed by W. K. Millholland Machinery Co. was designed primarily for drilling piston pin holes in job lots for replacement manufacturing where various sizes of pistons are put through in relatively small lots. The machine will take pistons from 2¾" diameter to 6" diameter. The two No. 4 Millholland Automatic Cam-Operated Drilling Units mounted opposed on a welded steel bed have motors mounted on top with multiple V-belt drive to the spindle. Speed changes are made by changing the sheave pulley. The Drilling Units are mounted in bases and are adjustable by

SUB-LANDS

TO SOLVE YOUR STEP CAVITY PROBLEMS



Patents pending on all Mohawk Sub-Land tools.

To be able to concenter cutting tools has been an ultimate aim of engineers and tool makers for years. At last MOHAWK TOOL CO. has designed an accurate sub-land that insures perfect concentricity for any step cavity problems.

Fortunately, MOHAWK'S method establishes a perfectly circular land along the entire length of the lower flutes which guarantees holes machined to size and concentric. Because of this feature, MOHAWK'S SUB-LANDS can be used all the way to the shank by simply re-grinding the steps. All flutes are specifically designed for the type of material they are to cut, each being polished and provided with ample and positive chip clearance. SUB-LANDS have over-lapping cutting edges which make perfectly square clean corners and faces.

We regularly manufacture two, three, and four step SUB-LANDS with a minimum size of .200 and maximum size of 3½" on the small size.

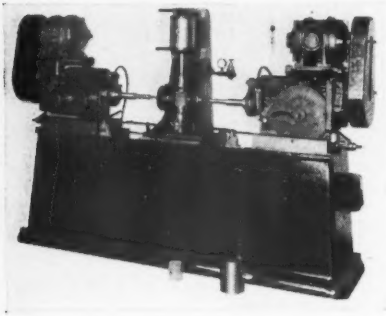
The use of this type of tool constitutes an immeasurable saving in machine time, operations, man hours, and in the elimination of innumerable inspection problems. DELIVERY—3 to 5 weeks.

SEND FOR DESCRIPTIVE FOLDER AND FURTHER INFORMATION.

Mohawk TOOL COMPANY

21647 DEQUINDRE ROAD • HAZEL PARK, MICHIGAN

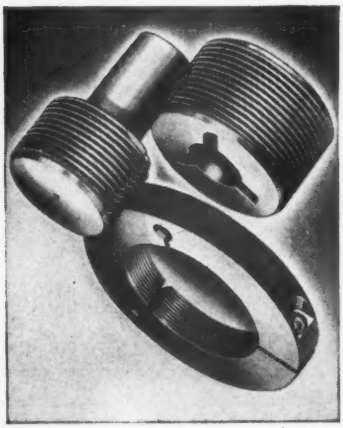
means of screw and micrometer dial for different diameters of pistons. Feed changes are provided by splined pick-off gears which vary the ratio of drive from the spindle to the cam shaft. Plate cams are provided for various increments of travel for different lengths of piston bosses and can be changed by removing four bolts. The fixture on the machine locates

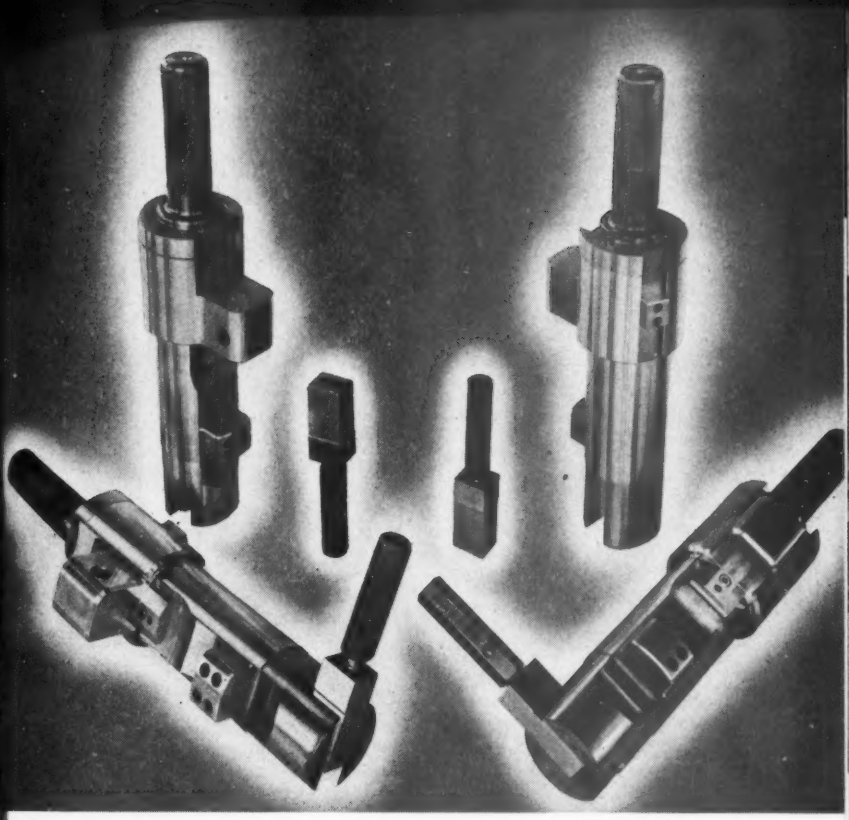


the pistons in the usual manner from the open end and with V-blocks for squaring up by the piston bosses. The machine is semi-automatic in operation and is controlled by two control valves at the operator's position, one for clamping and one for starting the machining cycle. Write W. K. MILLHOLLAND MACHINERY CO., 1046 Fairfield Ave., Indianapolis 5, Ind., for further details.
INFORM-A-GRAM KEY No. B57-R

A NEW WELDING PROCESS for lengthening the thread life of new gages and for salvaging old gages worn beyond tolerance limits has been announced by the GEORGE O. GRIFFIN CO., 1301 West Hadley St., Whittier, Calif. Worn gages are reclaimed by removing the threads, welding on a solid deposit of chrome-carbide alloy and then grinding new "on size" threads in this wear-resistant deposit. New gages are similarly constructed by welding the alloy onto specially prepared blanks. The Griffin process should not be confused with plating. Threads are ground in the solid and are of chrome-carbide alloy from the crest of the thread to well below the root. Although the life of Griffin processed gages on individual jobs varies, depending upon the material being gaged, it is claimed that gages constructed by this process outwear ordinary thread gages by at least 20 times. Griffin processed thread plug gages can now be furnished in sizes from ⅜" and larger; thread ring gages are available in sizes of ⅞" and larger. A folder will be sent by the George O. Griffin Co. on request.
INFORM-A-GRAM KEY No. C9-R

NEW METAL CUTTING TOOL. A new, improved tool of a non-ferrous alloy has been added to the Jessop Steel Co.'s line of cutting tools. It is made up principally of Chromium, Tungsten and Cobalt and ranges in hardness from 60 to 62 Rockwell C, thus bridging the gap between high speed and cemented carbide cutting tools. The new tool is cast-to-shape and is used in the as-cast condition, that is, other than being surface ground. Exceptionally high red-hardness is shown by the tool inasmuch as only one point drop in Rockwell C is noted at temperatures ranging as high as 1900° F. It is claimed that this tool has proven that increased feed, speed and depth of cuts are possible on many applications where high speed tools are now generally used. Peak efficiency is realized when cutting at speeds from 20 to 80% over the top speeds for high speed tools and because of





MASTER WORKMANSHIP

Our experience as Army and Navy materiel tool and gage makers will be incalculably valuable to manufacturers when their conversion to peacetime production requires prompt delivery of dependably accurate Gages, Jigs, Fixtures and other Special Precision Tools. We also specialize in Thread Grinding. Our inspection meets the most exacting specifications.

BUILDERS OF PRECISION TOOLS — GAGES • • JIGS • • FIXTURES

TOOLS *and* GAGES

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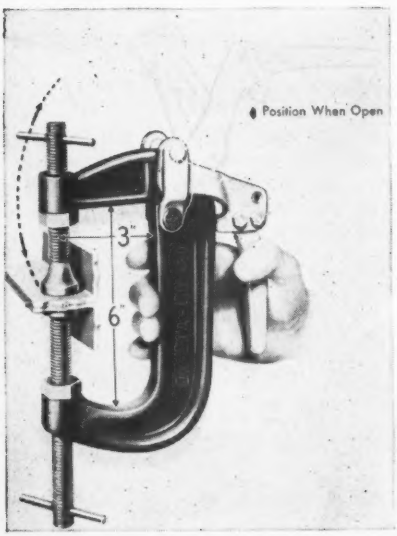
3112 EAST 63rd STREET • CLEVELAND 4, OHIO

MICHIGAN 7230

the inherent toughness of the tool, intermittent cutting even of chilled castings is possible. This alloy cannot be hot worked and is not susceptible to heat treatment. Jessop will furnish both flats and squares for tool holder bits or for milling cutter inserts, surface ground to tolerances of 0.000 to —0.005". Round sections will be centerless ground to the same tolerances and die inserts or other complicated sections will be furnished in the as-cast condition. Additional information will be sent on request by JESSOP STEEL CO., Washington, Pa.
INFORM-A-GRAM KEY No. 259-R

NEW "C" CLAMP. Detroit Stamping Company of Detroit has recently developed an improved toggle-action "C" clamp, known as the Model No. 480, which securely holds a wide range of work. Double angles and other irregular shapes are held by two adjustable clamping spindles which grip the work at any selected point. The clamping gap is readily adjustable to any thickness within the clamp range. Each spindle is locked into its place and remains at that exact setting until manually readjusted. The rapid toggle action provides quick clamping and release. When released the entire upper portion of the clamp swings clear of the work. The body of sturdy malleable iron casting and the threaded spindles copper coated against welding spatter are other features of this improved clamp. Links and handles are plated against corrosion. By changing the location of the retaining bolts, the toggle handle may be adjusted to either a straight out or downward position when the clamp is locked. This new De-Sta-Co Model No. 480 clamp is a 6" size with an extra deep 3" throat. For further information write DETROIT STAMPING CO., 344 Midland Ave., Detroit 3, Mich.
INFORM-A-GRAM KEY No. 165-R



AN INSPECTION LAMP, known as the FS Opaskope, has recently been developed by the FISH-SCHURMAN CORPORATION, Dept. J, 230 East 45th St., New York, N. Y. This all-purpose lamp can be employed for inspecting objects placed on its stage (as illustrated) or its light can be sent in any direction, illuminating objects that cannot be placed on the stage. This is possible with a new specially designed friction swivel which makes it easily and smoothly adjustable to any height or angle. An especially important feature when living or delicate tissues are observed is its highly corrected spheric and aspheric lens combination which produces a powerful, concentrated and uniform beam of light that is free from chromatic aberration. The size of light is controllable. Send for bulletin describing the FS Opaskope and listing available inspection lamp accessories.
INFORM-A-GRAM KEY No. 761-R

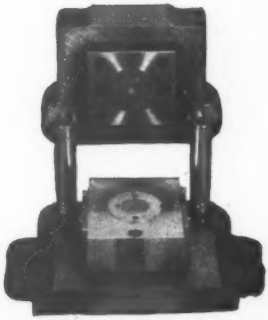
EXCEL POWER HACKSAW. Designed for use as an auxiliary or standby unit for departments remote from the sawing room, this Excel Power Hacksaw is made in both floor and bench models and for either wet or dry sawing. It will handle any work up to 4" square stock. A quick action vise holds the work securely in place and the desired cut can be made at any angle up to 45°. The Excel Hacksaw will cut soft material such as aluminum, Bakelite, fibre, cast iron, etc., at the rate of 80 strokes per minute; medium materials such as annealed tool steel, alloy

HOVIS UNIVERSAL MASTER WASHER DIES PURCHASED NOW....CAN BE USED FOR POSTWAR EQUIPMENT

You can purchase Hovis Master Washer Dies now, knowing that you are making a long-time, profitable investment. When reconversion comes, Hovis Dies will fit into your program for peacetime products.

THE MASTER DIES THEMSELVES DO NOT BECOME OBSOLETE

This naturally means a tremendous advantage by saving the cost of complete new dies for new size washers. FIVE SMALL INTERCHANGEABLE PARTS are all that is required for each size washer whether for war production or for civilian purposes. By this modern system you effect economies also by eliminating all process engineering, tool designing, tool making and tool tryout. Send for our folder illustrating and describing in detail the Hovis advanced method of producing washers.



Made in 5 sizes:

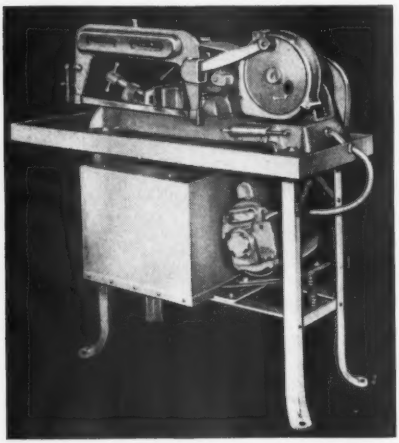
$\frac{3}{4}$"—1$\frac{1}{2}$"—2$\frac{1}{2}$"—4"—6".

HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD
Suburb of Detroit

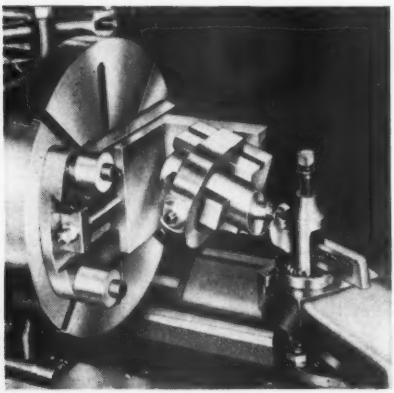
VAN DYKE, MICHIGAN
Phone: Centerline 1575

machine steel, etc., are cut at the rate of 60 strokes per minute; while spring steel and similar hard materials are cut at 40 strokes per minute. The floor model of this new power hacksaw measures 14¾" x 31". Your copy of



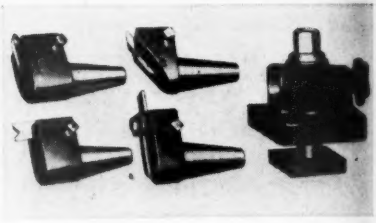
Bulletin MMX giving complete information and specifications with parts list and installation data as well as operating instructions will be sent on request by COVEL MANUFACTURING CO., Benton Harbor, Mich.
INFORM-A-GRAM KEY No. 742-R

LATHE ANGLE PLATE. The new No. 51, manufactured by Best Tools Corporation permits many unusual operations on any standard make lathe, and eliminates the need for many costly special jigs and fixtures usually needed to machine intricate jobs on a lathe. This lathe face plate attachment is positioned



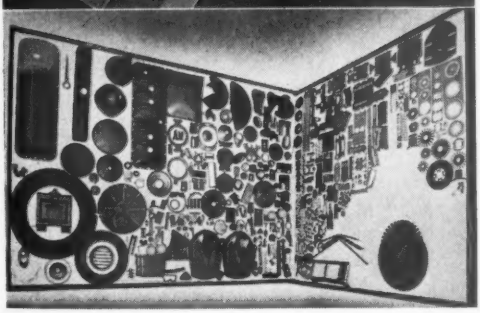
by a locating plug in the head stock spindle and is then bolted to the face plate. Since it is equipped with an adjusting screw, the use of size blocks or calipers enables work to be located with a high degree of accuracy. The No. 51 can handle specialized shop jobs such as offset radius turning, cutting eccentrics, angle boring, turning compound angles and other operations not ordinarily considered as straight lathe work without special jigs and fixtures. Literature will be sent by BEST TOOLS CORP., 486 Sunrise Highway, Rockville Centre, Long Island, N. Y.
INFORM-A-GRAM KEY No. B43-R

THE K-J QUICK CHANGE LATHE TOOLS manufactured by Kyle-Johnson Machine Co. permit a change to any kind of operation without the use of wrenches after an engine lathe tooling set-up has been determined. Fine height adjustment of all tools is maintained regardless of change of tools from one operation to another or from lathe to lathe and instant positioning and accurate repeating is assured. Quick tool changes are made by turning the draw screw lock by hand. This releases the tool to be removed and the next



tool is slipped into the special non-bind tapered recess, quickly drawn into full position and rigidly secured. The machine feed facilitates drilling, while threading, turning or alternative operations in any combination may be done at the will of the operator. The K-J Quick Change Lathe Tools will take all the feed the lathe itself will stand. All torque is taken up by vertical adjustment screw. More information will be sent on request by KYLE-JOHNSON MACHINE CO., 1629 West Pico St., Los Angeles, Calif.
INFORM-A-GRAM KEY No. B60-R

A HARD CHROME PLATED ROTARY FILE AND BURR has recently been developed and placed on the market by the Carbide Specialties Div. of Park Engineering & Tool Co. It is manufactured by special processing as to heat treating and surface finishing before being plated. Tests have proven this tool to exceed the normal high speed steel tool life five to ten times and in addition, to provide additional tool life after each reconditioning. If more information is desired, write CARBIDE SPECIALTIES DIV. of Park Engineering & Tool Co., 1116 Southfield Rd., Lincoln Park 25, Mich.
INFORM-A-GRAM KEY No. B58-R



DIES

Off hand you wouldn't consider that die making had any relation to violin making. Two dies, like two violins, may look alike. But the test in each case is in how they perform. A complete knowledge of the job to be done, the selection of materials, correct design and superior craftsmanship—all must be right to get outstanding performance.

For over 20 years Star has built all types and sizes of dies, with a good percentage of the tough jobs that gravitate to the contract shop with a reputation for always doing a good job.

Designers and Manufacturers

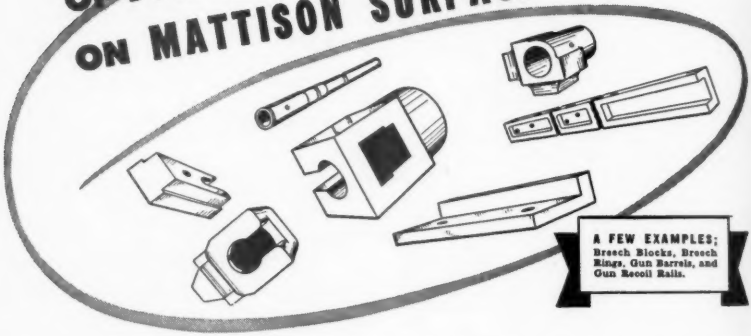
OF DIES • JIGS • FIXTURES • GAGES • SPECIAL MACHINERY • JIG BORING • PLANER EQUIPMENT

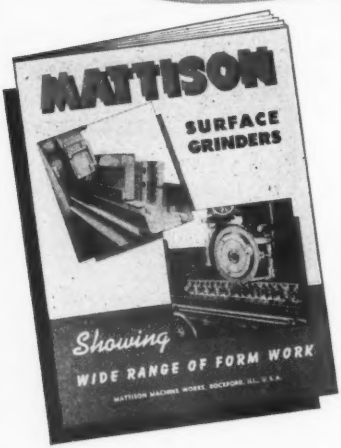
STAR ★
MACHINE & TOOL COMPANY

9320 Woodland Ave • Cleveland 4, Ohio

WIDE RANGE

OF FORM WORK NOW BEING GROUND ON MATTISON SURFACE GRINDERS





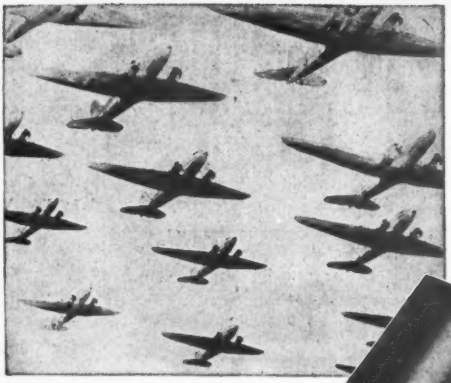
Through the use of special fixtures and contour dressing devices the above parts are all being ground on the Mattison High-Powered Precision Surface Grinder with a great saving of time and to extremely close limits of accuracy. These applications are important, not only from the standpoint of present production needs, but because they illustrate the unlimited capacity of Mattison Grinders over and above regular flat grinding. To you it opens up a new opportunity for grinding, a new opportunity for saving and a new opportunity for increasing production on work previously thought impossible to grind.

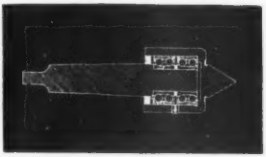
Ask for new free book, showing these and other unusual jobs ground by means of special fixtures and dressing devices on the Mattison Grinder.

Send for this NEW BOOK

MATTISON MACHINE WORKS—ROCKFORD, ILLINOIS

PRECISION ALIGNMENT...





4

ROWS OF PRECISION BALL BEARINGS

QUADRO Precision LIVE CENTERS will outlast old-fashioned solid centers to pay for themselves quickly. They combine the rigidity of the solid lathe center with the frictionless properties of the ball-bearing to form a tool which will increase production without sacrificing accuracy. Manufactured in all tapers and sizes.

Write for Circular.

DAKON
TOOL AND MACHINE CO., INC.

QUADRO *Precision* LIVE CENTERS

Consider These 9 ADVANTAGES of the Sunnen Precision Honing Machine for INTERNAL FINISHING

1. Hones and finishes internal cylindrical surfaces from .185" to 2.625"
2. Accuracy is guaranteed within .0001"
3. Produces a super-smooth finish
4. Used in ferrous or non-ferrous metals, plastics, ceramics, glass, etc.
5. Accurately duplicates sizes
6. Does not require skilled labor
7. Can be "set-up" for any size in one minute
8. No jigs or fixtures needed
9. Economical to operate

Some recent refinements add to the accuracy and efficiency of the Sunnen Precision Honing Machine. A new base and coolant pump has been added that provides a constant flow of honing fluid to the work. A machine light makes inspecting and gaging parts easier.

Yet, with all these advantages, the Sunnen Precision Honing Machine is low in cost. Let a Sunnen engineer give you complete information — or write for free catalog.

The coveted Army-Navy "E" waves over the Sunnen plant, evidence of the important part Sunnen equipment is playing in the war effort.

Typical Jobs

Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

Saved time in producing a smooth, accurate finish on this bronze remote control valve body.

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro inch finish.

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.

Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter — held to .0002", stock removal .001", 60 per hour.

SUNNEN PRODUCTS COMPANY

7947 Manchester Avenue,
St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

SUNNEN

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SCIENCE • RESEARCH • METHODS • TOOLING
PRODUCTION • TRADE NEWS AND REPORTS

Battelle Memorial Institute Fifteenth Anniversary of Service to Industry

"Research In Action" is the title of a 60-page brochure devoted to illustrating and describing the personnel, plant and equipment, and research functions of the internationally renowned Battelle Memorial Institute of Columbus, Ohio. We could not better acquaint our readers with Battelle than to relay "A Message From The Director" which appears in the brochure over the signature of Clyde Williams, Director of the Institute:

"On July 1st of the present year, this Institute completed its fifteenth year of service. Founded to conduct research for industry on a non-profit basis, Battelle began operations in 1929 just as the great industrial boom of the late twenties was coming to an end. Throughout the ensuing world-wide depression, the recovery of the thirties and the violence of the second World War, Battelle has continued to grow. The staff, originally thirty, now numbers six hundred, and the Institute today is known and respected throughout the world of research and engineering.

"The founder established an endowment which has yielded sufficient income to provide buildings and equipment for the Institute's continued growth and also to support a continuing program of fundamental research. In order to carry out the will of the founder that the Institute 'serve mankind through the making of discoveries and inventions . . .' Battelle has provided its unique 'research for industry' plan.

"In this cooperative activity the Institute provides the plant, the equipment and the personnel. The company or the group under whose auspices the research is done—known as the 'Sponsor'—pays for the time of the personnel assigned to the enterprise and the out-of-pocket costs. The amount of money thus annually invested in sponsored research projects at Battelle was $80,000 in 1933 and will be an estimated $2,500,000 in 1944. In addition, Battelle annually contributes large sums from its endowment income to provide plant and equipment for the ever-increasing needs of this fast-moving program.

"Battelle Institute today can be described as a center of 'research in action' where practical industrialists and scientists meet on a common ground of understanding. In its fifteen years of experience with the practical problems of more than one thousand different companies, Battelle has obtained an unusually broad understanding of the technical needs and requirements of industry. By applying scientific research in a wide variety of industries to a wide variety of problems it has made an important contribution to industrial progress.

"In the course of its service to industry Battelle has: developed new products and new materials; improved existing products and materials; reduced production costs; improved manufacturing processes; uncovered new markets and uses for materials; rectified the causes of product and process failures; established control of procedures for production operations; developed values for by-products and industrial wastes; discovered satisfactory substitutes for expensive or critical materials; made economic and technical studies of new inventions; evaluated business ventures in technical fields; conducted marketing and production surveys; aided private companies and whole industries in the

organization of research plans and programs and advised financial groups on the economic implications of technical discoveries.

"These activities have resulted in a constantly increasing store of knowledge and experience that inevitably are applied to the work in hand. This, as well as the splendid research facilities described in this booklet, has contributed greatly to Battelle's success. The most important factors in its success, however, have been the high quality of the staff and its team work.

"In recent years the Institute has received an increasing number of requests for information concerning its activities. The ideal way to secure this information is through a personally conducted tour of the plant. By this means a visitor can see at first hand the equipment and facilities of the Institute and, more important still, can learn something about the men who use these facilities and the methods they employ. There are many, however, who would like to have in print an over-all description of the activities of the Institute. For the benefit of these persons, the accompanying non-technical account of the major activities has been prepared and illustrated by pictures of the staff, plant and equipment."

Study Metal Secrets Through Electron Microscope

By means of three-dimensional pictures photographed through an electron microscope, and enlarged to 100,000 diameters on a three-dimensional Polaroid vectograph, it is now possible to study and measure the shape and space characteristics of minute metal structures that are extremely difficult to see in ordinary photographs.

This was demonstrated recently for the first time at the 29th Annual Meeting of the Optical Society of America, held at Hotel Pennsylvania, New York, by Robert D. Heidenreich of the Dow Chemical Company, Midland, Mich., where the electron microscope has been used in the investigation of corrosion phenomena in magnesium alloys.

It was shown that the point of a pin can be made to appear as vast and rough as a mountain range when photographed through an electron microscope and enlarged on the vectograph, revealing the shape of ultra-microscopic crystals of which magnesium and other metals are composed.

"The combination of the electron microscope and the Polaroid vectograph process offers metallurgists a peephole into the microcosmos," Heidenreich declared. "We can now examine the shape of micro-structures just as one can examine the formation of rock in a quarry. The increasing store knowledge of new characteristics of metals will doubtless be utilized in the development of new alloys that perform even better than those we have today."

New Supervision Training Films Are Now Available

Produced by the Office of Education, Federal Security Agency, to help train thousands of new foremen and supervisors in war industries, a series of 16 motion pictures called "Problems in Supervision" is available.

Each motion picture in the series takes up one aspect of supervision, raises questions commonly faced by supervisors, and suggests practical ways of meeting the problem. The films do not give "final answers," but are intended to provoke thought and discussion.

The films were produced by three commercial producers—Caravel Films and Herbert Kerkow, New York City, and Mode Art Pictures, Pittsburgh—under contract to the government. They may be purchased from Castle Films, 30 Rockefeller Plaza, New York City, the contractual distributor of all Office of Education visual aids—or may be rented from many 16 mm educational film libraries. Copies of instructor's manuals are furnished without charge by the Office of Education to users of the films.

Following are the titles, running time, and prices of the films. Schools receive a 10 percent discount.

150.	A New Supervisor Takes a Look at His Job	13 min.	$19.21
151.	Planning and Laying Out Work	10 min.	16.73

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New South Bend Lathe

CATALOG

MAILED ON REQUEST . . . WRITE TODAY FOR YOUR COPY

SIZES AND TYPES OF SOUTH BEND LATHES

Engine Lathes—9" to 16" swing, 3' to 12' bed length.

Toolroom Lathes—9" to 16" swing, 3' to 8' bed length.

Precision Turret Lathes—½" and 1" maximum collet capacity.

All sizes and types of South Bend Engine Lathes, Toolroom Lathes, and Precision Turret Lathes are clearly illustrated in color and described in this new catalog. Complete specifications including capacities, speeds, feeds, and weights are printed opposite the illustration of each lathe. All construction features, accessories, and attachments are also shown. Every user of machinery should have a copy of this catalog at hand for ready reference. Contains 64 pages, 11" x 8½" for standard file. Write today for your copy of Catalog 100-D.

Also, ask for details of our Post-War Priority Plan if you are now planning for the future. This will assure you prompt delivery when civilian production is resumed.

BUY WAR BONDS • SAVE FOR LATHES

SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 38 YEARS
SOUTH BEND 22, INDIANA

	Conditions	9 min.	15.48
153.	Working with Other Supervisors	8 min.	14.24
154.	Introducing the New Worker to His Job	16 min.	23.35
155.	Instructing the Worker on the Job	14 min.	21.49
156.	Placing the Right Man on the Job	13 min.	19.21
157.	Supervising Workers on the Job	10 min.	16.73
158.	Supervising Women Workers	11 min.	17.35
159.	Maintaining Workers' Interest	13 min.	19.21
161.	Every Minute Counts (Lateness, Loafing, and Absenteeism)	10 min.	16.73
163.	Improving the Job	9 min.	16.11
164.	Maintaining Quality Standards	10 min.	16.73
167.	Using Visual Aids in Training	14 min.	21.49
168.	The Supervisor as a Leader, Part I	14 min.	21.49
169.	The Supervisor as a Leader, Part II	13 min.	19.21

Eight of the pictures were shown to Government personnel directors, trade and industrial representatives and vocational specialists at a preview held in Washington on October 17, at which Arthur B. McLean, Director of Personnel, Federal Security Agency, introduced the films.

Universal Drill Bushings

Back in 1919 Universal Engineering Company originated the idea of standard drill bushings. Today, 25 years later, on their silver anniversary, Universal has grown from a small shop to a full fledged leader in the drill bushing field. Other Universal products include standard collet chucks, floating chucks, centering chucks, boring chucks, boring bars, grippets and plungers. Write today for catalogs on any or all of these precision made products.

Further "tightening" of the rating policy on machine tools costing more than $500 was made effective recently by the War Production Board.

WPB Further "Tightens" Machine Tool Ratings

An amendment to Order E-1-b, effective October 19, provides that ratings for machine tools costing more than $500 will be assigned only if the tools are required for military purposes, or are needed urgently for purposes related to the war effort. This clarification gives effect to WPB's Press Release WPB-6678 that a minimum of ratings will be assigned to non-military orders for machine tools.

WPB's rating policy on equipment required for reconversion was tightened on October 13, 1944, by an amendment to Priorities Regulation 24. This provided that ratings will be assigned only in those exceptional cases where a critical bottleneck exists in the availability of a few key items of machinery or equipment, or where an extremely urgent

Read how Industrial Users* are profitably applying Deepfreeze Sub-Zero Chilling Machines

In a wide field of application, Deepfreeze Cascade −120° F. Industrial Chilling Machines are producing superior results not possible under previous methods. No more convincing proof can be offered than the comments of industrial users. Here are a few typical statements:

Tool Hardening

"Form tool became dull after running 150 pieces . . . after chilling in a Deepfreeze machine, tool cut 510 pieces . . . foreman said, 'Why don't you treat all our tools in the Deepfreeze?' "

Metal Stabilizing

"Our experience with Deepfreeze has been very satisfactory . . . in stabilizing our gauge blocks and large lapping flats, we have been able to promote all of the growth and thereby prevent any subsequent distortion."

Shrink-fit Assembly

"Our Deepfreeze machine saves us $3,000 to $4,000 per month over the cost of liquid air for chilling a bushing assembled in a Diesel engine piston . . . another type of chilling unit did not provide sufficient shrink for proper assembly."

Low-Temperature Testing

"Aircraft instruments and components, both production items and experimental models, tested in a Deepfreeze machine . . . saves much time and expense in eliminating difficulties which otherwise would not show up until the item had been in use on the airplane at high altitude."

Deepfreeze sub-zero chilling machines are also used profitably for improving magnetic properties of steel magnets, storage of aluminum rivets and parts, salvaging of worn gauges, and many other practical industrial applications.

**Names on request.*

Removes 1000 B.T.U.'s per hour −120° F.

Deepfreeze sub-zero temperatures can be used easily, economically and with uniform success in any industrial plant . . . large or small. The Deepfreeze Cascade −120° F. Industrial Chilling Machine has the capacity for *high production* metal chilling. It will remove 1000 B.T.U.'s per hour at −120° F. when work is immersed in convection fluid. Has over 31 sq. ft. of primary freezing surfaces and 4 in. of Santocel insulation.

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Write for *"Cold Treating Practice"*—new 40-page illustrated booklet of recommended procedures and latest authentic information. Ask for Bulletin 1-4.

Only Motor Products can make a "Deepfreeze"

Deepfreeze

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE

Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

2307 DAVIS STREET
NORTH CHICAGO, ILLINOIS

Division of Motor Products Corporation, Detroit, Michigan

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need for such equipment has been established.

Under the latest amendment E-1-b, non-military purchasers will be required to place unrated purchase orders. They must furnish proof that adequate delivery dates cannot be obtained on that basis before any WPB consideration will be given to the assignment of a rating for the tools desired. Full justification must be given for delivery dates requested by consumers in advance of dates that can be promised by producers on unrated orders, WPB said.

No change in rating policy has been made affecting machine tools costing less than $500, WPB officials said.

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It contains a wealth of information on the "HARDSTEEL" technique of drilling steels hardened by any method and the machining of tough abrasive metals—24 pages of text, illustrations and tables—summing up the experience of our own research engineers and thousands of users who have employed "HARDSTEEL" Drills, Tool Bits and Tool Tips on all kinds of work.

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A highly informative "Executive Study", just published by the Labor-Management Division of Robbins Company, Attleboro, Massachusetts, is now ready for distribution.

Labor Relations Survey

This comprehensive sixteen-page report is the result of a national survey of industrial Labor Relations with particular emphasis on Employee Service Award Systems. Six sectional labor areas covering more than 2,275,000 workers provide the facts on which this study is based.

Liberally illustrated with full color charts and visual analyses, this booklet reports managements' experience with the use of tested employee relations techniques. Its timely contents warrant the close scrutiny of every Management, Labor Relations and Personnel Executive.

A copy will be mailed upon request to firms employing 300 or more persons. Address Labor-Management Division, THE ROBBINS COMPANY, Attleboro, Massachusetts. Ask for "Executive

America's ball and roller bearing industry will experience little trouble in switching from war to peacetime production, according to H. O. K. Meister, of Harrison, N. J., president of the Anti-Friction Bearing Manufacturers Association.

Ball and Roller Bearing Post War Picture

Almost immediately after the war, according to Mr. Meister, the industry will be in a position to supply the avi-

DOUGLAS *Precision* MACHINES

The Douglas Miller combines rigid, well balanced design with convenience of control making it particularly suitable for accurate work in tool room as well as for general production. It is available in plain or universal type.

Showing operation with Universal Milling attachment on tool room job producing a production fixture.

Showing operation with four cutters machining alloy steel for high precision aircraft parts

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Prompt Delivery to War Plants

The Rotorex Universal Tool and Cutter Grinder will accurately perform all kinds of tool grinding operations. Readily interchangeable attachments are available to set up machine for single-purpose jobs such as cylindrical, internal and radius grinding.

Operation showing set-up for internal grinding.

Operation showing set-up for sharpening straight gash bobs.

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ation, automobile, air conditioning, electrical, construction and machinery industries and other peacetime customers, with the bearings that have been going into guns, warplanes, tanks, and other instruments of war.

ATLAS DIE FILER

This sturdy and well designed bench type machine, for rapid and accurate die filing and sawing, will eliminate many costly hand operations.

Complete with motor and saw attachment at

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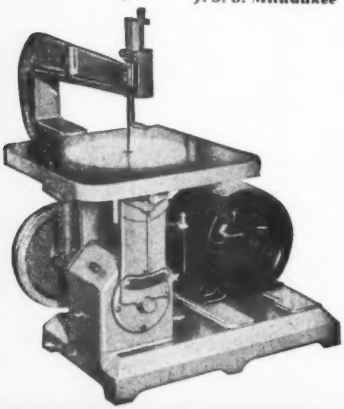

Milwaukee Chaplet and Mfg. Co.

1023 S. 40th St. • MILWAUKEE, WIS.

Some rearranging of production set-ups will be required and there will be some changes in the sizes of bearings to be produced, but the industry confidently expects to take these changes in stride.

The problem of surplus women workers is likewise not serious, since the number of women workers in the industry has always been high, in war and peace, and it is expected that many working women will leave to become homemakers when the fighting men return to resume their jobs in the industry.

American-made bearings are expected to be in big demand in Australia, China and certain South American countries—as well as in the bombed countries in Europe—when the war ends.

Veteran Aid Apprentice Training Program

Preparing vocationally handicapped veterans for skilled postwar jobs is the purpose of an apprentice training program recently inaugurated by the Cooper-Bessemer Corporation which became the first among the thousands of Ohio industrial companies to start such a program in cooperation with the Rehabilitation Division of the Veterans Administration.

A group of veterans has already started the course at Cooper-Bessemer's Mt. Vernon, Ohio, plant, according to Steven Hurtuk, chief of the training division at the Veterans Administration Hospital at Brecksville, Ohio, and it is expected that the company will start additional apprentice groups in the near future as discharged soldiers with accredited aptitudes become available.

Cooper-Bessemer's successful four-year apprenticeship course, developed over a period of many years, calls for 8222 hours of shop work and 768 hours of related class-room instruction by capable full-time instructors. Those completing the course receive from the state a "certificate of completion" to show that they definitely qualify as journeyman machinists.

Each veteran will receive standard apprentice pay from Cooper-Bessemer, plus a monthly maintenance allowance from the Government, so that his combined income will approach that of a

TWO SYMBOLS OF RELIABILITY

IN Bridges and in drills you expect the same sturdy qualities you hope to find in men—a readiness to tackle anything; an unquestioning obedience to instructions; a capacity for "sticking to it" until the job is done. Celfor Drills and Reamers meet those qualifications—They are made to.

All the native strength and toughness of finest tool steels are preserved and utilized by Clark's Celfor process. Typical of that tough reliability are Celfor Type B Reamers, made only by Clark; and Celfor high speed Twist Drills, forged to shape and twisted while hot — densifying the metal, producing tools that excel for strength and cutting qualities.

Good business sense — *find out* the facts about Celfor Reamers and Drills.

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OTHER CLARK PRODUCTS — **AXLES** (Front and Rear) **FOR TRUCKS AND BUSES ● AXLE HOUSINGS TRANSMISSIONS ● METAL SPOKE WHEELS ● ELECTRIC STEEL CASTINGS ● GEARS AND FORGINGS ● RAILWAY CAR TRUCKS ● BLIND RIVETS ● INDUSTRIAL TRUCKS AND TRACTORS**

journeyman machinist's. In this way, right from the start, the trainee and his family will be able to take their place in community life and civic affairs.

Widely known for his activity in the interests of the gray iron castings industry, Walter L. Seelbach, secretary-treasurer of the Forest City Foundries Co., Cleveland, was re-elected president of the Gray Iron Founders' Society by fellow directors at the 16th annual meeting and postwar planning conference of the association in Cincinnati October 10-11. Mr. Seelbach was one of the organizers of the trade group and served as its first president in 1928.

Seelbach Again Heads Gray Iron Founders

Also re-elected were H. L. Edinger, vice president, and F. H. Rayfield, secretary. Edinger is president of the Barnett Foundry and Machine Co., Irvington, N. J., and Rayfield is vice president of Potter & Rayfield, Inc., Atlanta, Ga.

Homer Britton, vice president of Cleveland Foundry Co., Cleveland, Ohio, a new director, was chosen treasurer and W. W. Rose of Washington was reappointed executive vice president. In the concluding session members of the society elected six new directors to serve three years. They are, in addition to Mr. Britton:

George H. Alten, president, Alten's Foundry and Machine Works, Lancaster, Ohio; Max Kuniasky, vice president, Lynchburg Foundry Co., Lynchburg, Va.; S. D. Russell, president, Phoenix Iron Works, Oakland, Calif.; Howard A. Stockwell, treasurer, Barbour Stockwell Co., Cambridge, Mass.; and Lawrence F. Williams, assistant secretary, Cooper-Bessemer Corp., Grove City, Pa.

WPB Removes Restrictions on Metal License Plates

Removal of its restriction on production of all kinds of metal license plates issued by State or other local governments was announced recently by the War Pro-

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Flame Hardening

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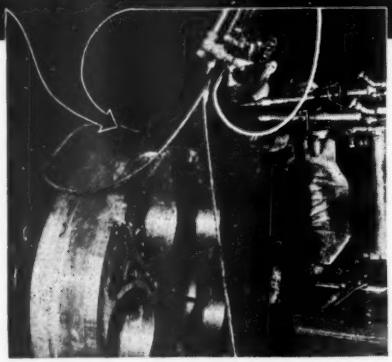

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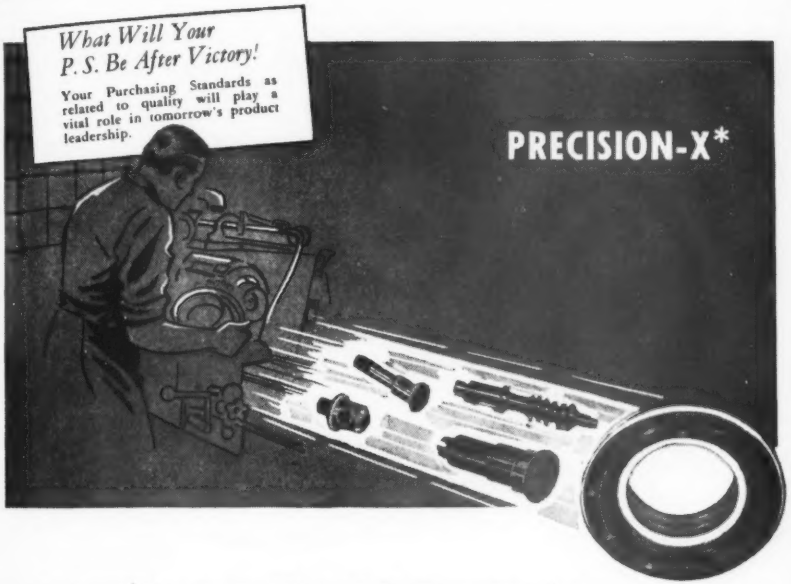
What Will Your P. S. Be After Victory!
Your Purchasing Standards as related to quality will play a vital role in tomorrow's product leadership.
PRECISION-X*

Delivers the *Extras* That Make *Better* Products

Precision-X by Smillie goes beyond ordinary precision. Whether it's precision parts, tools or fixtures, Precision-X* assures specific *extra* values that count in product performance.

Such as skilled engineering control . . . designing and building our own tools and gages . . . modern equipment for machining, milling, thread milling, grinding, finishing, inspection and skilled craftsmen who aim for the best.

Typical of Precision-X production has been the increasing volume of vital parts for aircraft, ordnance and the Navy that C. M. Smillie Company has been producing for Victory.

Each and every part produced here has contained these *extra* values provided in Precision-X. In over-all product performance they have meant fewer flaws, smoother operation, longer life. After victory, these *extras* in Smillie Precision-X will do the same for your product.

That's why in your purchasing standards related to quality you can expect these Smillie *extras* to count for more.

PRECISION-X*
** by Smillie*
Means the Extra Values in All Three
1. PRECISION PARTS
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TOOLS PRECISION SCREW MACHINE PRODUCTS FIXTURES
SMILLIE CORE BOX VENTS

SERVING INDUSTRY AND THE NATION FOR FIFTY FIVE YEARS

duction Board. This action, WPB officials explained, is in line with WPB policy to remove all controls or restrictions as they become unnecessary.

Because the supply of steel has become considerably freer in recent months, continued control over production of metal license plates, which use mostly steel, was considered unnecessary.

Three orders—L-32-b, L-32-a and L-32, which restricted metal license plate production, were revoked by the action. One important effect was to cancel the restriction providing that production of 1945 motor vehicle license plates be held at the rate of 50% of the number each governmental unit issued in 1942.

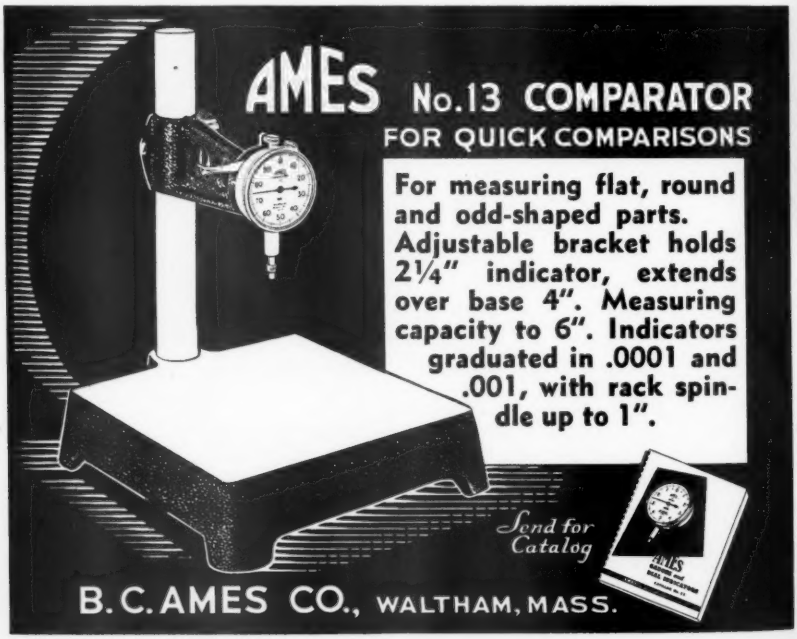
Study Common Standard for Screw Threads

The Combined Production and Resources Board, the Anglo-American-Canadian economic high command, has reported that progress was made at a conference of a joint mission in London for the purpose of trying to find a common standard for screw threads.

The simple matter of screw threads has been an incalculable factor in hampering production of interchangeable parts during the war, CPRB pointed out. The board cited the pre-war difficulties encountered when a piece of British machinery, such as an automobile, broke down in America, or when American apparatus required repair in Britain.

The conference was arranged by the British Standards Institution on behalf of the Ministry of Production and was attended by a joint mission from Canada and the United States—the first mission to be sent to the United Kingdom by the CPRB. The mission was led by Elmer J. Bryant, of United States, chairman, and J. G. Morrow, of Canada, vice chairman. The British delegation in the conference was led by Stanley J. Harley, chairman, and Percy Good, vice chairman.

The need for a single basic standard for screw threads in common use in place


AMES No.13 COMPARATOR
FOR QUICK COMPARISONS
For measuring flat, round and odd-shaped parts. Adjustable bracket holds 2¼" indicator, extends over base 4". Measuring capacity to 6". Indicators graduated in .0001 and .001, with rack spindle up to 1".
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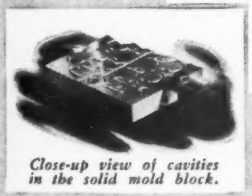
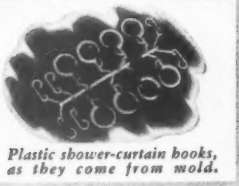
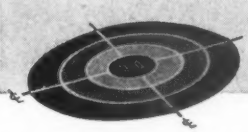
Could you Mill this 14 Cavity Mold complete in 52 Hours?



Close-up view of cavities in the solid mold block.



Plastic shower-curtain hooks, as they come from mold.



Photos — Courtesy
Kampa Manufacturing Co.

1000-P

This 14-cavity plastic mold is a "sticker" if you try to produce it by ordinary methods — but read this report of its production with the Milwaukee Rotary Head Milling Machine!

The Milwaukee Rotary Head method made it possible to set up both halves of this shower curtain hook mold on the machine table. One cavity of each shape was then laid out by means of a scriber held in the machine spindle. Each milling operation was first performed on the location of the layout and then repeated for each additional cavity. Uniform and unvarying precision is repeated by this multiple origination of cavities with the Rotary Head method. Total milling time complete — 52 hours.

Write for Bulletin 1002-C for full information on this unusual machine tool and the Rotary Head method of milling.

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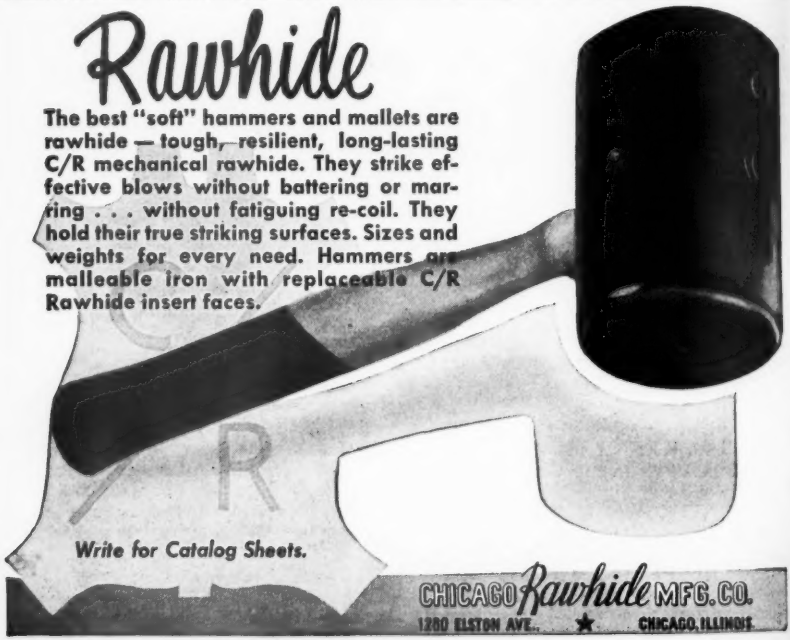
of the two separate systems which are not at present interchangeable was examined. The existence of these two systems has caused considerable difficulties in the production of items of equipment for common use in the prosecution of the war.

A number of specialized types of screw threads also came under review and considerable progress was made in the formulation of recommendations for common standards. The general question of design and drafting procedure, including limits and fits for plain dimensions was considered and it was felt that the possibility of establishing a uniform practice for the three countries should be explored.

Recent U. S. Patents

Among recently issued U. S. Patents the following are of Tooling interest. If you are interested in studying any of these Patents, simply advise "Patent Information Service", The Tool & Die Journal, 2460 Fairmount Blvd., Cleveland 6, Ohio, enclosing 20 cents for each Patent desired and we will gladly forward your order to Washington.

HONING MACHINE, No. 2,343,275.
RIVETING DEVICE, No. 2,343,278.
SCREW FASTENING WITH SELF-RIVETING HEAD, No. 2,343,283.
SETTING GAUGE FOR CUTTING TOOLS, No. 2,343,309.
DRILLING APPARATUS, No. 2,343,319.
METHOD OF MANUFACTURING RESIN-BEARING FIBROUS PULP ARTICLES, No. 2,343,330.
FEEDER FOR AUTOMATIC SCREW MACHINES, No. 2,343,364.
VISE, No. 2,343,391.
FORGING MACHINE, No. 2,343,403.
MACHINE FOR CHAMFERING GEARS, No 2,343,407.
BROACHING MACHINE, No. 2,343,420.
BENDING BRAKE, No. 2,343,441.
HONING APPARATUS, No. 2,343,500.
TABLE DRIVE FOR MACHINE TOOLS, No 2,343,503.
TABLE DRIVE FOR MACHINE TOOLS, No. 2,343,504.
ANTIFRICTION SCREW DEVICE, No. 2,343,507.
GEAR CUTTER, No. 2,343,508.
METHOD OF CROWNING GEARS BY SHAVING 2,343,567.
CHUCKING DEVICE FOR USE IN SCREW AND SIMILAR MACHINES, No. 2,343,570.
ANTIFRICTION GUIDEWAY FOR RECIPROCABLE TOOL SUPPORTS, No. 2,343,575.
GRINDING MACHINE, No. 2,343,577.
THREAD ROLLING MACHINE, No. 2,343,588.
TOOL CENTER, No. 2,343,626.
TAP CONSTRUCTION, No. 2,343,632.
GRINDING FIXTURE, No. 2,343,637.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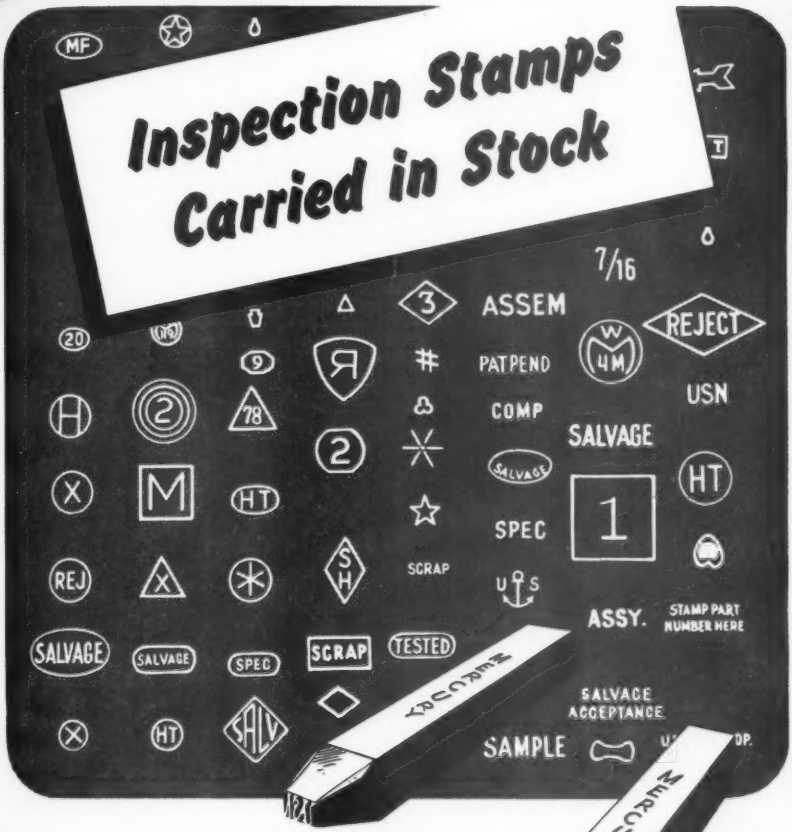

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PUBLICATION PREVIEWS

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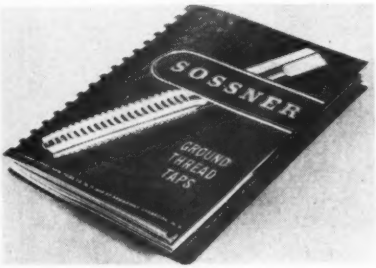
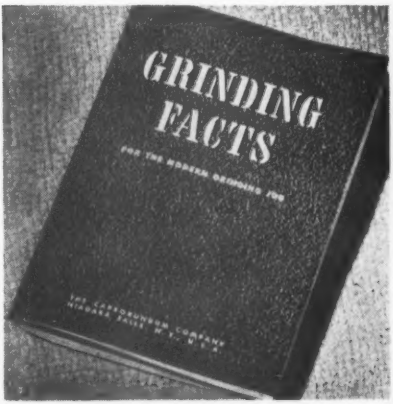
SOSSNER TAPS—Tap Handbook No. 44 just issued by the Sossner Tap and Tool Corp., combines a most comprehensive presentation of the Sossner line of quality, precision taps with an abundance of textual and tabulated information necessary for a full understanding of tap selection requirements. The book comprises six parts and an appendix, and is of the ready reference type designed for convenience under rugged shop and office conditions. A substantial, free-working spiral plastic binding plus stiff wear resistant covers



make it a fast working reference tool. The comprehensiveness of the handbook is indicated by the titles of the several parts, i.e., Tap Terms, Tap Selection, Standard Taps, Specials, Thread Limits, Tap Dimensions and Appendix. Sossner high speed taps are offered both as commercial and precision ground from solid stock and include American National, Full and Modified Whitworth as well as British Association forms. The portion of the book devoted to "Specials" is particularly enlightening both as to Sossner skills and highly specialized threading problems and their solutions. The handbook is available without charge to all tap users upon request on company stationery stating name and position of person requesting it. Requests should be sent to the SOSSNER TAP AND TOOL CORP., Dept. TJ, 161 Grand St., New York 13, N. Y.
INFORM-A-GRAM KEY No. A2-R

DIAMOND DRILL BITS are pictorially described in a 12-page booklet available from the WHEEL TRUEING TOOL CO., Dept. TJ, 3200 W. Davison Ave., Detroit 6, Mich. Truco Bits, designed to provide maximum diamond recovery and to avoid breakdowns which necessitate superfluous rod-pulling are available in all standard sizes. The complete line of Truco Drill Bits including coring, blasting, pilot and casing bits are shown. Reaming shells in two different patterns are made in sizes to correspond with the various bit sizes.
INFORM-A-GRAM KEY No. 522-R

GRINDING FACTS has just been published by the CARBORUNDUM CO., Dept. TD, Niagara Falls, N. Y., to acquaint grinding wheel users with the newly announced standard markings for identifying grinding wheels and other bonded abrasives. This 136-page reference book on grinding includes a complete explanation of the new marking symbols; a comprehensive schedule of grading recommendations for general, toolroom, diamond wheel, and thread grinding applications; a description of each common type of grinding; safety rules; and a table of useful speeds.
INFORM-A-GRAM KEY No. A10-R



MOHAWK SUB-LANDS, a revelation in cutting tools, are manufactured for those with the problem of machining stepped cavities. The use of this type of tool constitutes an immeasurable saving in machine time, operations, man hours, set-up fixtures and the inevitable waste of material. A leaflet describing and illustrating these tools is available from the MOHAWK TOOL CO., Dept. J, 21647 DeQuindre Rd., Hazel Park, Mich.
INFORM-A-GRAM KEY No. B88-R

APPLICATIONS OF COLMONOY WCR ALLOYS to cutting tools are presented in literature available from WALL-COLMONOY CORP., Dept. J, 720 Fisher Bldg., Detroit 2, Mich. Instructions for the brazing of Colmonoy wear-resistant tips to steel parts are included. Colmonoy No. 6 is recommended for cams, bushings, valve seats, thrust collars, acid pump parts, centerless grinder rests, lathe points, dogs, chip breakers, drill flutes, wire straightening shoes, thrust bearings, and all parts that must resist severe wear, corrosion, heat and galling.
INFORM-A-GRAM KEY No. 849-R

MACHINE TOOL GEAR-BOX DRIVES—Gear-box drives for machine tools are a comparatively new development in the machine tool field and the TURNER UNI-DRIVE CO., Dept. D, 3416 Terrace St., Kansas City 8, Mo., is the oldest gear-box drive manufacturer offering modernizing units to the machine tool industry. A complete, 16-page catalog illustrates applications of Turner Uni-Drives to lathes, shapers, milling machines, automatics, and to special purposes. Specifications as to size, power, speed and weight are given in all cases and for all models. Line drawing show over-all sizes and mounting requirements. In addition to prices of the several models a complete parts price list covering each model is included in the catalog.
INFORM-A-GRAM KEY No. C5-R

DRILLS, REAMERS and other cutting tools and accessories comprising the Celfor line are listed and briefly described in Catalog No. 22 published by the CLARK EQUIPMENT CO., Dept. TD, Buchanan, Mich. In addition to the standard sizes shown, special sizes and types can be made to order. This catalog emphasizes that it is essential to keep a drill point properly shaped and sharp in order to enjoy best results.
INFORM-A-GRAM KEY No. C2-R

PRECISION JIG BORER and accessories are featured in a 16-page booklet published by MOORE SPECIAL TOOL CO., INC., Dept. TJ, 740 Union Ave., Bridgeport 7, Conn. The necessity of cutting a clearance slot down through the hole for guiding the quill has been eliminated by "setting-in" the rack below the circumference of the quill. This construction

New THREAD PICK-UP PROJECTOR
INCREASES GRINDER PRODUCTIVITY
AS MUCH AS 50%... SOMETIMES MORE!

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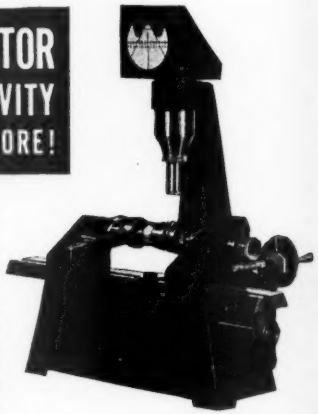

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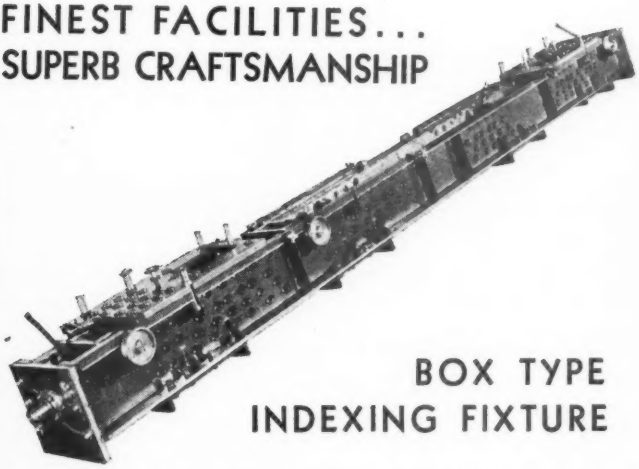

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increases the bearing surface and allows true and perfect lapping of the holes. This new feature adds greatly to the stiffness of the spindle and quill.
INFORM-A-GRAM KEY No. 589-R

B & G JUNIOR QUENCHER for controlled quenching where small pieces are heat treated is illustrated in Catalog JC-744 recently published by the BELL & GOSSETT CO., Dept. DJ, Morton Grove, Ill. This quencher eliminates human error by reducing the cooling process to a purely automatic operation in which the final results can be predicted with certainty. No storage tank is necessary as enough liquid is contained in the system to handle the quenching volume required.
INFORM-A-GRAM KEY No. 206-R

TOGGLE-ACTION CLAMPING DEVICES are featured in Catalog 44 just released by KNU-VISE, INC., Dept. T, 1330 Plum St., Detroit 16, Mich. Its 58 pages carry photographic reproductions of the full line of Knu-Vise products, including clamps of four types, "C" clamps, pliers, and wrenches, together with line drawings showing dimensions of the various sizes and descriptions. Information on recommended pressures of the various models is given.
INFORM-A-GRAM KEY No. 649-R

DUSTKOP dust collectors for collecting the dust from all sizes of surface, tool, pedestal and disc grinders and sanders are illustrated in Bulletin A-200 recently issued by the AGET-DETROIT CO., Dept. T, 617 First National Bldg., Ann Arbor, Mich. Dimensions of dust collector units are shown in sketches as well as in specification tables in each section, a further aid in quickly determining the space requirements of the dust collector. Accessories required for the installation, together with the prices of the complete dust collecting units, are given.
INFORM-A-GRAM KEY No. 577-R

"CLINTON" PRECISION CUTTING TOOLS are featured in a leaflet released by U. S. MACHINE TOOL MFG. CORP., Dept. D, Clinton, Ind. Form Cutters, Circular Thread Chasers, Multiple Thread Milling Cutters, Shell or Ring Type Cutters, Radial Relieved End Mills, Involute Spur Gear Cutters, Worm Gear Hobs, Single Thread Milling Cutters, Threading Dies and Taper Shank Cutters are illustrated.
INFORM-A-GRAM KEY No. B83-R

DRILL BUSHINGS, PINS & BUSHINGS—The latest literature of the ACME INDUSTRIAL CO., Dept. TD, 200 N. Laflin St., Chicago 7, Ill., includes drill bushings, dowel pins, and leader pins and bushings, all toolroom specialties and time and cost savers. The Acme drill bushing catalog is color coded and gives all Acme Standard bushings and accessories in green and all ASA bushings and accessories in red. In both cases, all sizes, styles,

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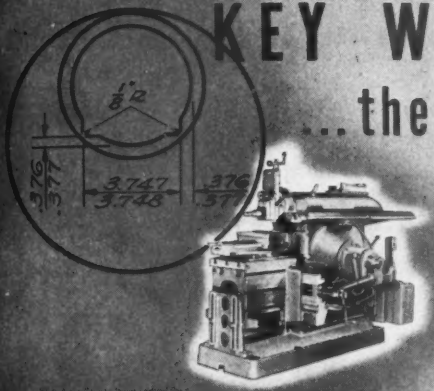

. . . . Internal shaping is another function of the Shaper requiring accurate performance. Here a Cincinnati Shaper holds close tolerances cutting Kennedy Key Ways in an eccentric.

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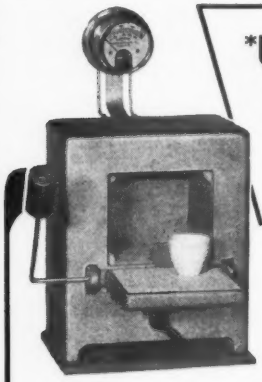
and types are specified in detail and keyed drawings give all significant dimensions. Acme Standard dowel pins, hardened and ground, are detailed on a data sheet covering National Emergency Pins—Revised List, which is much less limited and condensed than was the original National Emergency recommendation. Acme blue label pins are .0002" over nominal diameter, tolerance + or — .0001" and Acme red label pins are .001" over nominal diameter, same tolerance. Acme leader pins are hardened and ground to +.0002" of listed diameters and Acme leader pin bushings are hardened and ground to within .0002" of listed size with outside diameters having press fits of .002".
INFORM-A-GRAM KEY No. 59-R

"STAR DUST" LABORATORY-GRADED PURE DIAMOND POWDERS are described in a leaflet issued by ACE ABRASIVE LABORATORIES, Dept. J, 1 Spruce St., New York 7, N. Y. Star Dust makes possible the finishing of flats to optical flatness in minutes instead of hours. Superfinishes can be produced to less than one micro-inch in a short time.
INFORM-A-GRAM KEY No. 928-R

CLARK HARDNESS TESTER which provides for true "Rockwell testing" is described in an 18-page booklet available from CLARK INSTRUMENT, INC., Dept. TDJ, 10200 Ford St., Dearborn, Mich. Pictured is the Clark dial indicator, which records degrees of hardness directly at the precise instant of measurement. It tests hard and soft steel, brass, aluminum, cast iron, copper, other metals, alloys, and plastics. Simple operating directions are pictorially described.
INFORM-A-GRAM KEY No. 120-R

WALESITE—A laminated Lignin Plastic for Wales plate sets of the plate set system and templates to mount Wales hole punching and notching units are described in Bulletin 6 issued by WALES-STRIPPIT CORP., Dept. T, 345 Payne Ave., N. Tonawanda, N. Y. This uniformly dense material is resistant to water, oil, grease and dilute acids, and is readily adaptable to most fabricating operations. It can be sawed, turned, drilled, tapped, threaded and milled.
INFORM-A-GRAM KEY No. 60-R

PRECISION GAUGES & PRODUCTION FACILITIES—A four-page bulletin issued by the MASTER GAUGE CO., Dept. TD, 2222 Fenkell Ave., Detroit 21, Mich., illustrates many of the precision thread plug, thread ring, thread concentricity, build-up, snap, profile, flush pin, plain ring and plain plug gauges offered by this gauge manufacturer. Also incorporated is a standard thread plug gauge price list and quantity discount schedule. The Master Gauge Company's capacity for the production of dies,



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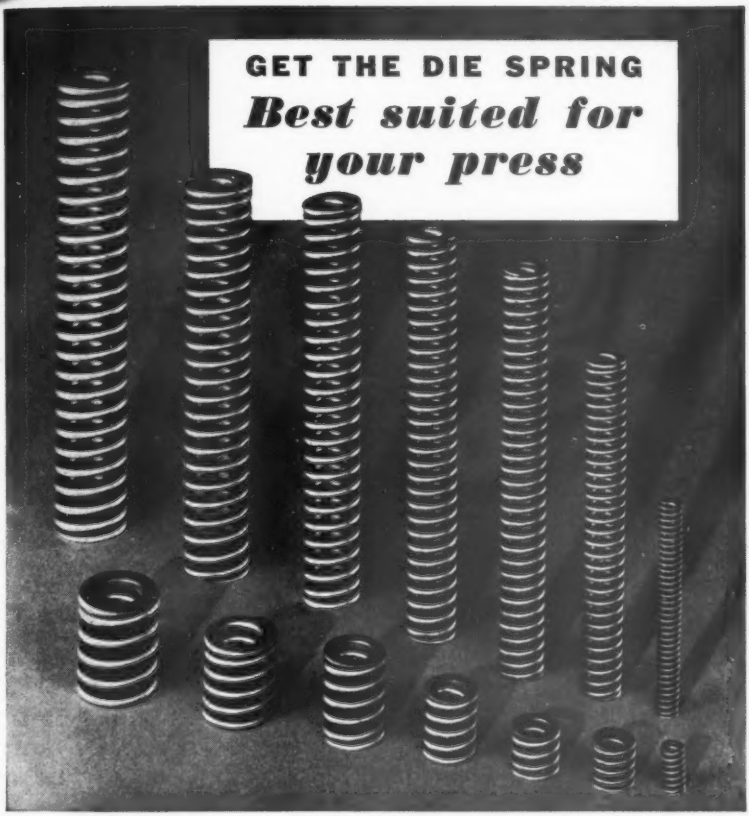

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jigs and fixtures as well as precision thread grinding on production parts is detailed on the last page of the bulletin which consists of a list of their toolmaking and production equipment.
INFORM-A-GRAM KEY No. C3-R

DIAL INDICATOR AND COMPARATOR Catalog No. 53 covering all Ames impersonal measuring instruments will be available after December 1 from the B. C. AMES CO., Dept. T, Waltham, Mass. This new 56-page catalog which includes approved dimension data of American Gage Design Committee is entirely rearranged in context for the convenience and ready reference of buyers, design engineers, and other users of dial indicators and micrometers, comparators, cylinder gauges, and thickness measures.
INFORM-A-GRAM KEY No. 189-R

SMALL REAMERS from $\frac{1}{32}$" to $\frac{5}{8}$" diameter for precision work are pictorially described in a circular issued by METAL CUTTING TOOLS & MFG. CO., Dept. TD, 11121 Grand River Ave., Detroit 4, Mich. Built to precise, exacting standards, these reamers are recommended for finishing holes to decimal tolerances on aircraft, small arms, instruments, motors, engines, radio or any parts that call for extreme reaming accuracy.
INFORM-A-GRAM KEY No. 948-R

STRENES METAL—A special alloy metal for cast-to-shape drawing and forming dies is described in a 4-page illustrated pamphlet recently published by the ADVANCE FOUNDRY CO., Dept. TJ, 100 Parnell Ave., Dayton, Ohio. Automotive plants recommend this metal for forming bodies, fenders, hoods and various other parts for cars, trucks, tractors and planes. Long wearing and highly successful on deep draw operations and long runs, Strenes metal is close grained and takes a high polish.
INFORM-A-GRAM KEY No. B84-R

SINGLE-POINT DIAMOND TOOLS are interestingly described in a 18-page booklet published by J. K. SMIT & SONS, INC., Dept. D, 157 Chambers St., New York 7, N. Y. A table for determining diamond tool sizes, information on selecting the right diamond, and price list recommendations are included. The booklet advises turning the diamond frequently in order to expose a sharp cutting point. The Sta-Kool Holder, a patented tool, equipped with a series of internal ducts in order to quickly dissipate the heat generated in the nib, is pictorially described.
INFORM-A-GRAM KEY No. 48-R

BORING, DRILLING & MILLING MACHINE CATALOG which illustrates the many features of the new Portage No. 4 Horizontal Machine has been issued by the PORTAGE MACHINE

Hammond CHIP BREAKER and DIAMOND FINISHING GRINDER

★ **HANDLES ALL SIZE CARBIDE TOOLS . . .**
★ **ACCOMMODATES ALL ANGLES . . .**
★ **FULLY PROTECTED AGAINST GRIT AND SLUDGE . . .**
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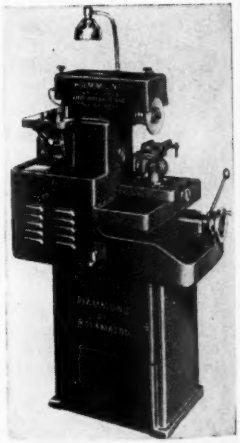

This grinder . . . with its rugged, heavy machine tool type construction throughout . . . makes it unnecessary now to just "get by" with light inadequate equipment.

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Johansson Gage Blocks, heretofore available only through AA-1 priority, are now available without priority.

The manufacture of chrome-plated Johansson Gage Blocks, discontinued since July, 1941 in the interests of meeting urgent production requirements for our regular steel Gage Blocks, has been resumed.

In accordance with the arrangements previously in force, worn sets of Johansson Gage Blocks may now be returned to the factory, on an exchange basis, for new chrome-plated sets. This economical salvage service applies, of course, only to Johansson Gage Blocks, any of which (down to size 0.050") can be surfaced accurately with chrome plating. Write for new Price Schedule.

FORD MOTOR COMPANY, JOHANSSON DIVISION, *Dearborn, Michigan*

Ford

Johansson

GAGE BLOCKS

CO., Dept. J, 555 Miami St., Akron 11, Ohio. Their greater capacity machines have large tables and higher columns and are designed for bulky work. Construction and structural features of this boring, drilling and milling machine are fully described. Rotary tables 36" x 36" or 48" x 48" can be supplied as can vertical or horizontal attachments for jig boring.
INFORM-A-GRAM KEY No. A13-R

INTERNAL INDICATOR GAGES are presented in an 8-page illustrated booklet published by the SWEDISH GAGE CO. OF AMERICA, Dept. TJ, 8900 Alpine Ave., Detroit 4, Mich. Extremely accurate measurements without the exercise of exceptional skill on the part of the operator can be made with these gages.. Their large range of adjustment, positive three-point location, two-point measurements, double scale, direct setting from Johansson Blocks, and knife edge and lever amplifying mechanism are their main features.
INFORM-A-GRAM KEY No. B85-R

AIR GRINDERS & ACCESSORIES are illustrated in Catalog AT-3000 recently issued by the MADISON-KIPP CORP., Dept. TD, 20 Waubesa St., Madison 4, Wis. Illustrations of air tools in use, advice on oil for air grinders, a grinding wheel classification chart and information on lubricators are included. Among the accessories shown are abrasive tubes, rings and discs; abrasive sleeve and disc holders; felt buffing tips; grinding wheels; cutters; mirror finish tips; and screw shanks.
INFORM-A-GRAM KEY No. B86-R

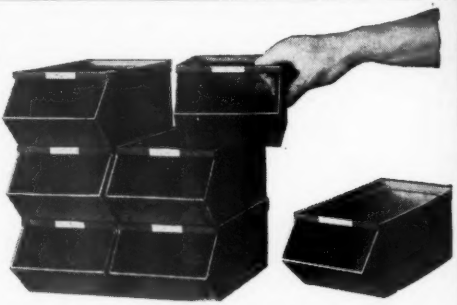
TRANSFER SCREWS which aid in definitely locating the die in proper relation to the punch on commercial die sets are illustrated in a bulletin issued by the HEIMANN MFG. CO., Dept. TD, Urbana, Ohio. Heimann Transfer Screw Sets eliminate clamping and are most essential when working from blind holes. They are complete in themselves, requiring no wrenches or screw drivers.
INFORM-A-GRAM KEY No. B89-R

EMPIRE LIVE CENTER with replaceable point designed for tool room tolerances is described in an illustrated leaflet issued by KING PRODUCTS, Dept. J, 68 Spring St., New York 12, N. Y. Its exclusively engineered features provide accurate, fast and economical production. Many different operations may be handled with the same live center by using interchangeably the various taper seat points.
INFORM-A-GRAM KEY No. 721-R

NUMBERALL ROTARY STAMPS and Numbering Machines are detailed in illustrated literature available from the NUMBERALL STAMP & TOOL CO., Dept. TJ, Huguenot Park, Staten Island 12, N. Y. Changes of characters are quickly made by rotating the type wheel with thumb and forefinger. Automatic Indenting Numbering Heads are used in foot, screw, lever or power punch presses for stamping

PARTS

where you want them— when you want them



You'll save time, space and labor handling parts and materials when you use these patented STACKBINS. STACKBINS keep parts instantly accessible—eliminate waste hand motions—stack compactly to form units of exactly the right shape and capacity—make order filling or assembly work faster, easier, more efficient.

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Manufactured and sold in Canada exclusively by Walter H. Wickware, Ottawa

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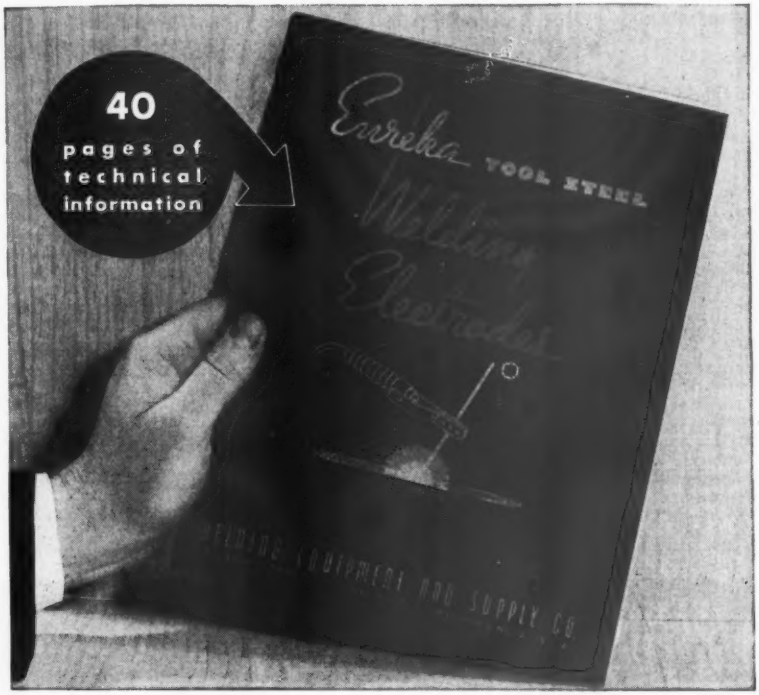

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It tells all about TOOL STEEL welding

★ This manual will help you save man-hours, conserve material and minimize production delays by outlining methods of repairing and compositely fabricating tools and dies, as well as correcting design and rectifying errors. Send for your copy of this manual today. It is fully illustrated with typical welding applications.

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consecutive numbers into metal, wood, Bakelite, fibre, celluloid, etc. Automatic and Non-automatic Numbering Machines are recommended for indenting and embossing figures and letters on metal, plastics, and other materials.
INFORM-A-GRAM KEY No. 602-R

TUBULAR MICROMETERS are featured in a 4-page leaflet issued by the TUBULAR MICROMETER CO., Dept. T, St. James, Minn. The light weight of these micrometers lends a more accurate "touch" to precision measurements. They were developed to serve a purpose where the necessity for a range of use required is within one inch. These may be purchased in sets to cover any desired range from 0" to 24", in 1" steps.
INFORM-A-GRAM KEY No. B91-R

SERIES 600 PRECISION ORIENTATION HEADS in various models are illustrated in an 8-page booklet issued by F & M SALES CO., Dept. J, 1054 Cahuenga Blvd., Hollywood 38, Cal. This new and improved head is readily adaptable to the various methods of sawing and wafering of quartz crystal now employed in the industry. All tables are 7½" in diameter and rotatable through 360°. Rotation is accomplished by means of accurately cut worm and worm gear segment carried by the circular band surrounding the table.
INFORM-A-GRAM KEY No. 287-R

THREADING & CUT-OFF TOOLS—Two bulletins illustrate and describe the Luers patented threading tools, cutting off tool holders and cutting off blades. The holder and associated parts of the threading tool are drop-forged of alloy tool steel and the cutters are made of the best selected, hammered, high-speed steel, hardened and tempered to a hard tough-cutting edge. Cutters are ground to correct thread angle and, in chasing threads, two correctly ground cutting points are always ready for use. The Luers cutting-off tools are of such construction that when the blade is locked in the holder the combination possesses all of the rigidity of a solid tool. The blades are held in the holder at an angle providing considerable top rake for a shear cut. A locking wrench and blade setting gage are supplied with each holder. Detailed literature and specifications are obtainable from J. MILTON LUERS, Dept. J, 12 Pine St., Mount Clemens, Mich.
INFORM-A-GRAM KEY No. C4-R

SAFETY PERIPHERAL MARKING HOLDER for stamping around the outer circumference of tubing has been developed by the M. E. CUNNINGHAM CO., Dept. TJ, 104 E. Carson St., Pittsburgh 19, Pa. The holder features a hand grip lock, and is equipped with a pointed screw which holds the unit firmly in position for marking. Assuring a clean, even impression, the Safety Peripheral Marking Holder eliminates the separate handling of

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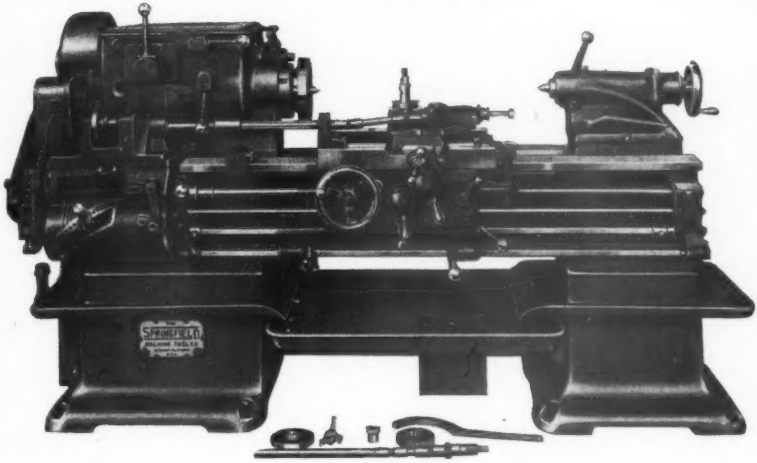
Out in front!



● Headstock . . . twelve speeds . . . only half of the easy-shifting spur gears mesh at one time.

Motors . . . V-Belt or silent chain drive.

Bed . . . permanently true—made of high test alloy to resist warp or marring under severe service.

Apron . . . extra heavy—operates on Ball and Bronze bearings throughout.

Taper attachment . . . hair-trigger adjustment.

Compound rest . . . sturdy, firm.

Tailstock . . . all bearings and bed ways oiled from one well.

From headstock to tailstock—the SPRINGFIELD Lathe is *out in front!*

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Tells the why and how of Springfield's accurate production.

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each character and permits peripheral marking around the end rather than marking along the length of tubes. Further details are available from the company.
INFORM-A-GRAM KEY No. 170-R

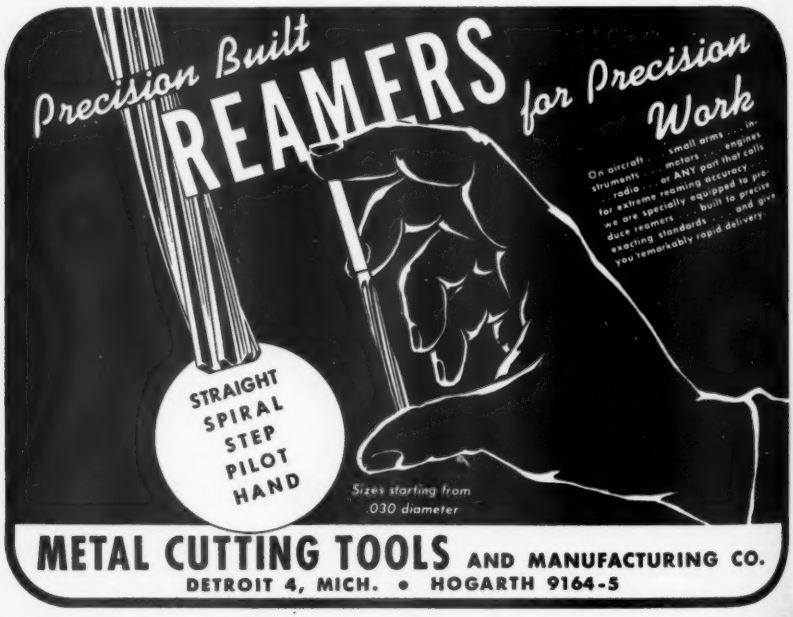
LIVE CENTERS which revolve on both ball and roller bearings of sufficient capacity to carry unusually high thrust and radial loads are described in an illustrated 4-page bulletin issued by MOTOR TOOL MFG. CO., Dept. TD, 7777 Cortland Ave., Detroit 4, Mich. A table of thrust and radial load capacities is included. The combination of large spindle, small head, short overhang, plus a special needle bearing at back of spindle, not only provides exceptional strength and rigidity but assures true running and the absence of chatter.
INFORM-A-GRAM KEY No. 124-R

3-FLUTE END MILLS which combine in a single tool all the advantages of two and four-flute mills, with none of the disadvantages of either are featured in Catalog 7 recently issued by MELIN MILLS, Dept. T, 1331 Phillips, S.W., Grand Rapids 7, Mich. Price lists along with a speed chart showing recommended speeds for Melin End Mills are included.
INFORM-A-GRAM KEY No. 109-R

FLEXIBLE SHAFT UNIT DRIVES are illustrated in Bulletin 44A published by the ELLIOTT MFG. CO., Dept. J, 201 Prospect Ave., Binghamton, N. Y. These Unit Drives can be applied to many finishing operations and wherever constant power in a portable tool is needed. The core of the Elliott Flexible Shaft Unit Drive rotates freely to account for the high efficiency obtained, even when turning within a small radius because of the unusual flexibility and strength of the core.
INFORM-A-GRAM KEY No. B28-R

"FLUD-LITE" MAGNIFIER ATTACHMENT—An auxiliary lens, No. 05, which doubles the magnifying power of Stanley inspection tools, and equipped with fluorescent lamps, is illustrated in a leaflet issued by the STANLEY WORKS, Stanley Electric Tool Div., New Britain, Conn. Use of the auxiliary lens is recommended for close inspection work and assembly of small parts whenever additional magnification is required. The lens, 2½" in diameter, is set in a cup-shaped frame; fits easily right under lens frame of magnifier and can be attached or removed in a few seconds' time.
INFORM-A-GRAM KEY No. 472-R

DIAMOND TOOLS are pictorially described in a 16-page booklet published by the WEST-COAST DIAMOND TOOL CO., Dept. T, 11601 Wilshire Blvd., Los Angeles 25, Cal. Standard wheel truing tools, standard thread grinder dressers, tungsten carbide diamond dressers, needle point diamond tools, shaped tools, cluster dressers, cup wheels, metal bonded diamond impregnated wheels, standard universal cutters for lenses, diamond charged metal sawblades, tungsten diamond wheels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Sizes starting from .030 diameter
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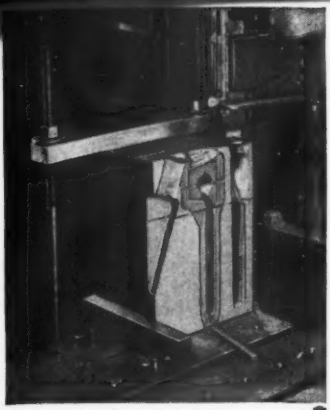

Peerless Heavy Duty Vertical in Harvey Spring Plant at Racine, Wisconsin, Manufacturers of a General Line of Commercial Forgings.

Vertical Sawing at Harvey Spring & Forging Company

The 16" Peerless Metal Cutting Saw is shown sawing the wornout face of a die block used in manufacture of box wrenches.

One cut and the die block is ready for another resinking die job, thus eliminating the necessity of a slow, costly shaping job.

Fast, accurate, and economical, the 16" Peerless Vertical, powered hydraulically throughout, will do many jobs — cut tangs in die blocks, saving metal for small jobs—true up dies—do slotting and slitting. Handles 10" x 24" stock without turning work.

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☐ Heavy-Duty Vertical Saw
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and diamond powder - glaziers are shown. Diamond sawblades are especially efficient and productive for slicing quartz, crystal, marble and certain types of plastics.
INFORM-A-GRAM KEY No. B90-R

THERMOSWITCHES for complete temperature regulation are illustrated in a 44-page booklet recently released by FENWAL, INC., Dept. T, 200 Pleasant St., Ashland, Mass. More than twenty Fenwal products, including installation drawings and photographs for both temperature and pressure control apparatus are presented. The Thermoswitch has had wide application in industrial and commercial use, and may be used throughout the entire range of temperature control work, from sub-zero to 1200° F. Various types have been designed for the control of temperatures of solids, gases, and liquids. New adaptations have been added for aircraft and railway use.
INFORM-A-GRAM KEY No. B87-R

HYDRAULIC BENDING & BEVELING MACHINE is described in a collection of illustrated literature available from HUFFORD MACHINE WORKS, INC., Dept. TJ, 315 Diamond St., Redondo Beach, Cal. This machine stretch-forms extrusions, rolled stock and narrow sheet stock of many materials to precise contours without wrinkling or springback, and with uniformity of physical and dimensional characteristics. Attachments for this machine include a Pneumatic Universal Gripper Jaw which provides a positive method of gripping material for stretching purposes and instantly releases it upon completion.
INFORM-A-GRAM KEY No. 936-R

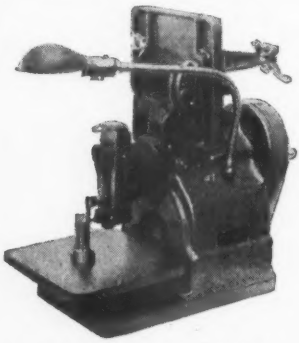
ELECTRIC HAMMER & DRILL—The Wodack combination electric hammer and drill for drilling in concrete, brick, stone, metal and wood is detailed in an illustrated folder, No. 442, released by the WODACK ELECTRIC TOOL CORP., Dept. J, 4627 W. Huron St., Chicago, Ill. The bulletin is complete, giving prices of the tool with different assortments of accessories, and includes a table of star drills covering seventeen diameters for five depths of drilling. A list of chisels and other hammer tools is included.
INFORM-A-GRAM KEY No. B93-R

TORQUE TOOLS—A 12-page booklet giving tables, formulae and a graph as aids to determining relative shearing torques for bolts, machine screws and studs has been compiled by the engineers of the APCO MOSSBERG CO., Dept. TDJ, 134 Lamb St., Attleboro, Mass. Besides presenting technical information for plant engineers, the booklet gives certain elementary definitions relative to torques, and offers recommendations for checking and maintaining Apco Mossberg torque tools.
INFORM-A-GRAM KEY No. C1-R

The **"DUPLEX"** *machine-files*

FLANGED PUNCHES - BLIND CAVITIES - MOULDS - DIES

Uses a controlled downward movement with an adjustable stroke.



DIES filed on upper table when swung down.

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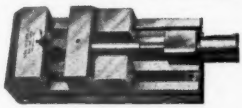
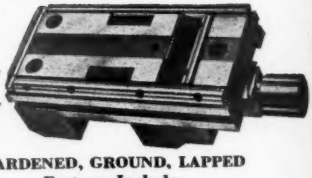
SINE VISES *Master Gage Builders!*

For SURFACE GRINDING, LAYOUT, INSPECTION OF GAGES, TOOLS, AND FINE INSTRUMENTS



No. 2 (Sine of 5") TILTS ONE WAY as Sine Bar. Opens Three Inches Size, 6"x2½"x2¼"

No. 3 TILTS THREE WAYS Sine of 6" & 3" Size 7½"x3½"x2¾" Opens 3½"



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Features Include:

1. **Precision Sine Rolls**
2. **Non-Projecting, fully covered, Telescoping Screw**
3. **Removable Grip Screw Knob**
4. **Prismatic Slide Jaw**
5. **Accurate Integral V-Block**
6. **Tolerance .0002"**

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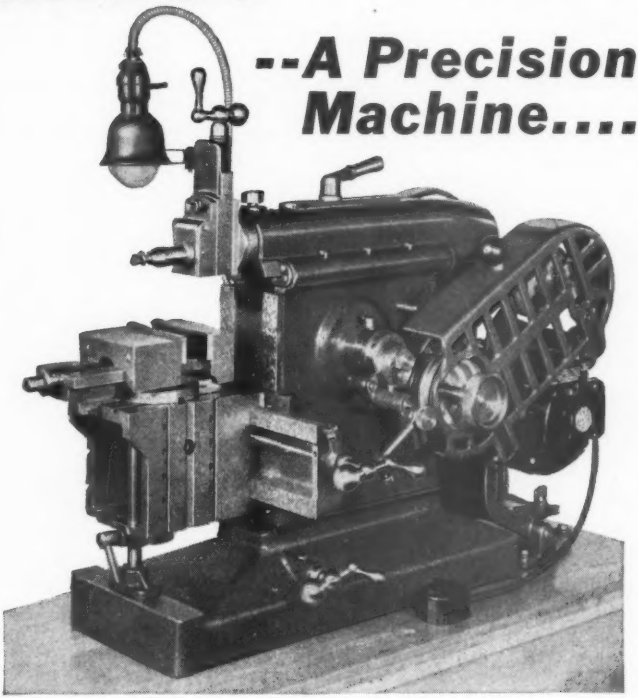
AMMCO 7″ SHAPER

--A Precision Machine....



On jobs requiring a stroke of 7″ or less, the AMMCO 7″ SHAPER will enable you to save a lot of time and expense on a set-up such as would be required on larger shapers . . . You also have an opportunity to effect considerable savings in capital investment . . . savings in electrical power consumption . . . and savings in floor space . . . Furthermore, in addition to getting away from the larger cost of operating a big shaper on small work, the AMMCO will leave big shapers open for big jobs . . . Users tell us "it's the finest made."

Available for stationary installation, or as a portable unit.

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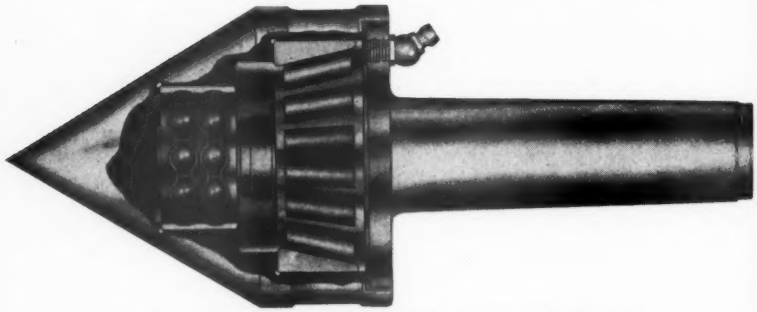
High speed steel centers were found wanting in modern high speed turning. Carbide tipped centers were a makeshift with the big drawback of distorted and mutilated center holes. Result—Scrap or a recentering operation.

Marveco solved the problem.

Have you tried your Marveco yet?



The MARVECO is GUARANTEED to OUTPERFORM and OUTLAST any other LIVE CENTER.

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THE ESSENTIALS OF HARDENING SIMPLE TOOLS AND PARTS are presented in the third edition of a small booklet by Frederick T. Potter, President of the Stark Tool Co., Dept. T., Waltham, Mass. The furnace, pyrometer equipment, procedure, quench and carburization are discussed concisely, from a practical-operation standpoint. The booklet, which can be read through in a half-hour or less, should be of interest to anyone concerned with the hardening of small tools.
INFORM-A-GRAM KEY No. C11-R

"LUCITE" MANUAL—This Manual is an outline of the procedures employed in fabricating "Lucite" (methyl methacrylate resin) cast sheets, rods, tubes and large castings. "Lucite" cast sheeting—United States Navy specifications P 41c (Grade A) and Army Air Corps specification 94-12014B is the form given the major attention. There is no attempt to prescribe exact procedures but working directions for the various general methods are given. Directions for blanking and punching, drilling, threading and tapping, routing and shaping, finishing, cementing and cleaning, among others, are given. There are sections on forming and on mounting and installation. The section on physical properties is rather complete—the mechanical properties being given in some detail and thermal and miscellaneous (resistance to chemical reagents) properties are included. Copies of "Lucite" Manual may be obtained from Plastics Department, E. I. du Pont de Nemours & Co., Dept. J, Arlington, N. J.
INFORM-A-GRAM KEY No. 859-R

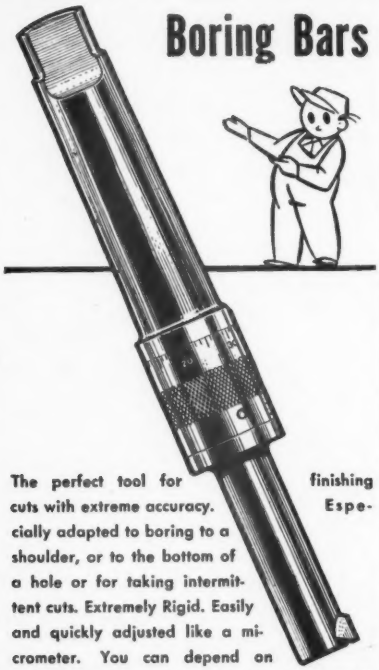
"PRACTICAL DESIGN FOR ARC WELDING"—This cloth bound volume consists of a set of introductory and explanatory sheets and 100 design plates prepared by Robert E. Kinkead, Hobart Square, Troy 1, Ohio. The volume is the first of three proposed volumes to be published by The Hobart Co. in response to many requests, following the original publication and distribution of a number of the design plates in loose leaf form. The first volume is priced at $3.50, the complete set at ten dollars.

The book is a practical working manual for the welder, manufacturer, engineer and designer. Detailed drawings show how tubing, plate, sheet, standard steel sections, angles and bars can be used to fabricate products by arc welding. A complete work sheet in graph form is placed opposite each design plate for notes, sketches or estimates. A Record form is provided as a part of the work sheet for use of the product designer or the job estimator. Thus a designer will be able to record his application suggestions and the estimator will have a permanent record for reference. All design plates are clearly marked with the fundamental welding symbols of the American Welding Society; the legend to the symbols is given on one of the introductory pages. A cross reference index, "Short Cut to Design Ideas," is provided.

"PLASTIC WORKING OF METALS AND NON-METALLIC MATERIALS IN PRESSES"—The new third edition of this excellent standard engineering handbook by E. V. Crane of the E. W. Bliss Company contains three new chapters, "Diversified Production," "Plastic States, Metallic and Non-Metallic," and "Molding and Forming," a total of almost 100 pages more than the second edition published in 1939. A good deal of attention is given in the latter two chapters to the physical properties of plastics materials and to molding problems and techniques. A noteworthy attempt is made to treat plastics materials as engineering materials in the same manner that the metals are treated. Tables of properties of thermoplastic and thermosetting materials, steel pipe data, hydraulic pipe selection, capacities of hydraulic presses and others have been added to the excellent appendix. This is

one of the small number of engineering handbooks that every designer of metal or plastics molds, dies or other press tools will find invaluable. The book is published at five dollars by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.

Universal MIKRO-LOK Boring Bars



The perfect tool for finishing cuts with extreme accuracy. Especially adapted to boring to a shoulder, or to the bottom of a hole or for taking intermittent cuts. Extremely Rigid. Easily and quickly adjusted like a micrometer. You can depend on graduations for controlling hole size to within .0005. All standard type shanks available. Singly or in sets. Prompt delivery. Write for catalog.

THE ASBESTOS FACTBOOK—This 16-page booklet outlines the uses of asbestos and asbestos products and gives a great many facts regarding the origin, sources, qualities and typical analyses of the principal types of this important, versatile, non-metallic mineral. Copies at 10 cents each may be obtained from the publication, "Asbestos", 17th floor, Inquirer Bldg., Dept. J, Philadelphia 30, Pa.

"HOT WORKING IMPROVES PROPERTIES OF METAL"—This 40-page booklet of special interest to designing engineers, metallurgists, users of forgings, production and management executives was recently issued by the technical committee of the Drop Forging Association, 605 Hanna Bldg., Cleveland, O. A step-by-step illustrated story traces the hot rolling processing from ingot to forging bar. Photos of etched cross sections show how the grain structure is refined and how flow-lines develop in the direction of working. The further hot-working in forging operations is then illustrated and described. The four methods of hot working steel by forging are given in detail. The booklet is unusually well illustrated with more than 200 halftones and diagrams and the language is not too technical. Many illustrations and descriptions of recently forged parts are given.

"A PRIMER OF ELECTRONICS"—This excellent introduction to electronics is written for the man who wants to understand the fundamentals and who does not have a background of electrical knowledge—and that is most of us. Written by Don P. Caverly, commercial engineer, Sylvania Electric Products, Inc., the presentation is extremely clear and simple. The reader is taken from the atom, electron, static and electron discharges through current, magnetism and electromagnetic radiation to an understanding of simple radio tubes, fluorescent lamps, cathode ray tubes, ignitron, thyratron and other tubes and their basic circuits for practical purposes. More than 200 specially prepared illustrations greatly assist in clarifying both theoretical and practical points. The book was written for salesmen who sell electron tubes and equipment. A good bibliography and a complete index add to the usefulness of the book. "A Primer of Electronics" is published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York, N. Y., at two dollars.

A HIGH SPEED STEEL DATA SHEET on their new Rex M-2 has just been released by the Crucible Steel Company of America, Dept. J, 405 Lexington Ave., New York 17, N. Y. Rex M-2 is a tungsten-molybdenum high speed steel, which gives superior performance on all operations for which a general purpose high

TIME AND MONEY SAVERS

Swing Frame Grinders, Idler Backstands using METALITE CLOTH *Belts*

The pressure for speed in turning out war materials greatly accelerated the installations of such machines—Swing Frame Grinders and Idler Backstands, both employing fast-running abrasive cloth belts.

But long before that, increasing numbers of plants had reaped the many benefits inherent in these modern mechanical aids that do better work faster and at much lower costs than old methods. In some cases four times the output, in others at a reduction of 75% in time.

These records forecast further and faster adoption of such time and money saving methods which could well have the prompt attention of all mechanical and purchasing personnel.

We will gladly supply information on the equipment (which we do not sell) as well as on the specially designed Metalite Cloth Belts (which we do).

Just a few lines on your letterhead.

Offer valid only in U.S.A.

BEHR-MANNING • TROY, N. Y.
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Reliable Coated Abrasives Since 1872

speed steel is required.

Typical applications are lathe, planer and boring tools, milling cutters, hobs, form and threading tools, twist drills, end mills, taps, reamers, broaches and chasers.

The data sheet gives information on critical temperature, forging, annealing, hardening, quenching, straightening, tempering hardness, and various test data on Rex M-2.
INFORM-A-GRAM KEY No. 256-R

A STANDARD STEEL ANALYSIS CHART has recently been made available by the American Steel & Wire Co., Dept. TD, Rockefeller Bldg., Cleveland 13, Ohio. The chart is printed on cardboard and arranged in such a way that the chart may be used as a booklet or hung on the wall for easy reference.

Data is given on carbon and free-cutting steels, manganese, nickel, nickel-chromium, molybdenum, chromium, chromium-vanadium, silicon-manganese, nickel-chromium-molybdenum, and National Emergency Steels.

This chart is an extremely valuable and convenient source of information on AISI, SAE and NE steels.
INFORM-A-GRAM KEY No. C12-R

MACHINE TOOLS for precision metalworking and woodworking are described in Catalog 43 issued by the LEWIS MACHINE TOOL CO., Dept. J, 3017 N. Main St., Los Angeles 31, Cal. These tools are complete sets of well designed, high quality rough or semi-finished castings with engineering blueprints for 23 practical units. They are sold for completion by home-craftsmen, training schools and machine shops. With intelligent reading of their blueprints, the average individual possessing a moderate knowledge of machine shop practice can complete equipment that will perform to close tolerances.
INFORM-A-GRAM KEY No. 690-R

RAYOTUBES & MICROMAX EQUIPMENT—The various methods by which war plants have been applying this equipment to new temperature-measuring jobs are described in Leeds & Northrup Company's recently revised Micromax Rayotube Pyrometer Catalog. Embodying, in this 48-page edition, basically the same engineering descriptions as were presented in the 1941 publication, it includes for the first time equipment being used to measure the temperature of molten cast iron, electric salt pots and blast furnace stove domes. Address the LEEDS & NORTHRUP CO., Dept. D, 4934 Stenton Ave., Philadelphia 44, Pa.
INFORM-A-GRAM KEY No. 360-R

MEASURING A PLUG GAGE WITH LIGHT WAVES

using an optical flat, a toolmakers flat and a gage block

The formula is:

$$D = h + \left(.000012 \times N \times \frac{W}{w}\right)$$

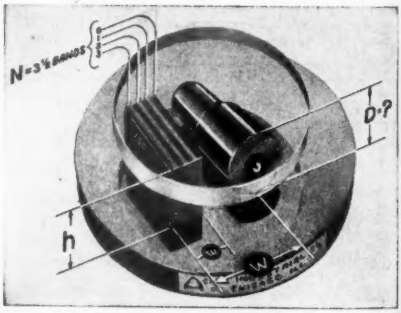
Substitute the actual values

$$D = .750 + \left(.000012 \times 3\tfrac{1}{2} \times \frac{1\ 7/16''}{23/64''}\right)$$

and get the answer

D = .750168 inch.

It's just that simple!



Write for new, free Lightwave Measurement Booklet.

ACME INDUSTRIAL COMPANY

Makers of Standardized Jig and Fixture Bushings

206 N. Laflin St. Chicago 7, Ill. MONroe 4122

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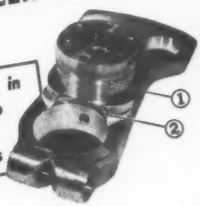
SPECIALISTS FOR OVER 50 YEARS

Tracer-Controlled MILLING

PROFILE MILLING SIMPLIFIED ...by TRACER CONTROL

Two Operations in a Single Setup without Changing Tools



• A prominent airplane engine manufacturer cut production costs, saved tying up expensive machinery and conserved skilled workmen by profile milling this radius of an engine crankshaft section on the Gorton Duplicator. Semi-skilled help operated this machine, obtaining smooth finish on the profiling of the irregular channel contour (1) on the part shown at right, and the milling of the channel (2) below this contour.

The Duplicator was set up with a special master in order to eliminate changing tools or resetting the work. A special fixture was used to hold the work at an angle to allow cutter access in milling the channel.

The Gorton Duplicator is the ideal machine for handling jobs like this where uniformity in quality and high precision repetition of all dimensions is required.

PRODUCTION DATA

Operations—Profile Mill .369" Radius and Mill Channel.
Machine—GORTON 9-J Super-Speed Duplicator.
Part—Rear of Crankshaft—Steel.
Cutter—Special .738" dia. Ball Cutter—4 Flute.
Holding Method—Special Fixture.
Feed—Manual.
Spindle Speed—500 r.p.m.
Stock Removed—1/8".
Floor-to-Floor Time—15 minutes per piece.

GORTON ENGINEERING SERVICE—

You are invited to consult Gorton engineers, without obligation, on your next production profile milling jobs. Gorton "Tracer Control" may give you the simplest, practical answer to lower cost production. Please submit part, print or specifications to your nearest Gorton Dealer or to the Gorton Factory at Racine, Wisconsin.

The Right Size The Right Type of Machine for Every Job... From 2 oz. to 2 ton

DIE BLOCKS

Tracer-Controlled MILLING

Tracer-Controlled DUPLICATING

Tracer-Controlled ENGRAVING

Tracer-Controlled ETCHING

GORTON Precision MACHINES

ETCHING MACHINES
2 & 3 Dimensional PANTOGRAPHS
Vertical & Universal Head Taper-Speed MILLERS
Manual & Electric Control DUPLICATORS

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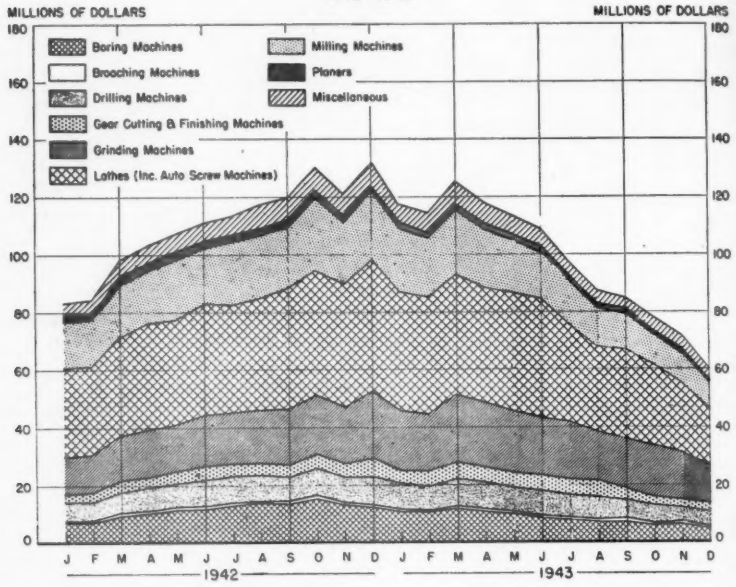
1211 Racine St., Racine, Wis.
Send me these free books

☐ Condensed Catalog
☐ Die and Mold Duplicators

Name..... Title.....
Company.....
Address.....
City..... State.....

VALUE OF MACHINE TOOL SHIPMENTS BY MAJOR TYPES

1942 - 1943



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Fluid-motion

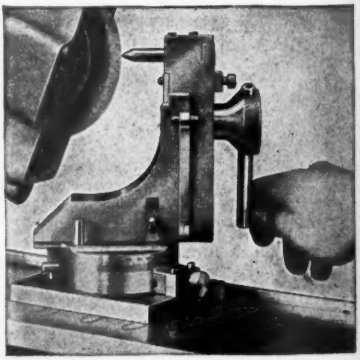
for modern form-dressing

ONE SETTING
HANDLE
CONTINUOUS MOTION

The J & S Model "E" Radii and Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable—regardless of cost.

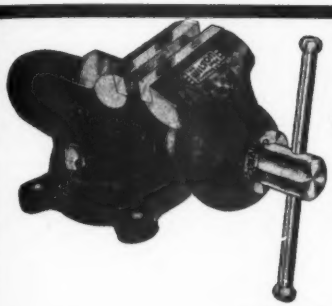
FEATURES

Fluid-motion dressing
.0001" accuracy
Automatic centering
14" wheel capacity
Large range yet compact
Chatterless and dustproof



J. & S. TOOL CO.

477 MAIN ST. E. ORANGE 4, N. J.



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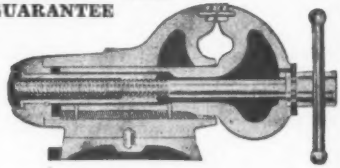
UNRESTRICTED 5-YEAR GUARANTEE



- **Less Weight, yet greater efficiency.**
- **Absolute Precision.**
- **Every part interchangeable.**
- **Indestructible.**

▼

Write for Literature

Sizes & Prices

Sizes 2", 3", 4", H.D., 4½" H.D. and 6" were built to conform with Federal Specifications GGG-V-436, as required by Army, Navy, etc.

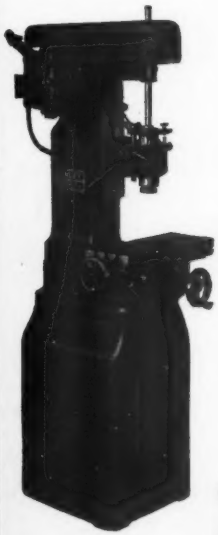
Width of Jaws	Maximum Opening	Approximate Weight	Price with Swivel*
2"	2¾"	4½ lbs.	$10.40
3"	4⅛"	21 lbs.	12.80
3" H.D.	4⅛"	30 lbs.	15.80
4"	5¼"	37 lbs.	18.60
4" H.D.	7"	47 lbs.	21.00
4½"	5¼"	39 lbs.	21.30
4½" H.D.	8½"	55 lbs.	27.50
5"	8½"	58 lbs.	33.60
6"	9½"	106 lbs.	62.00

Regularly furnished with Serrated Jaws. Can supply smooth steel, brass or copper jaws.

*Subject to Discount

ACME TOOL COMPANY

196 CHURCH STREET
NEW YORK 13, N. Y.



A LITTLE DEMON *for* *Small* DIES, JIGS, MODELS

The changeover of industry to civilian production means a repetition of toolroom bottlenecks . . . untold thousands of small jobs that will squander man hours, eat up profits . . . if they are scheduled on high capacity machines.

The solution is the LINLEY . . . small, compact, fast, accurate . . . the ideal Milling and Jig Boring machine for die and jig making, models, metal patterns, drilling, reaming, etc. You have a choice of 8 speeds to 4250 r.p.m.; set-up and changeover are fast and simple; smooth, rigid operation is assured; maintenance reduced to a minimum.

The Linley makes friends with toolmakers, makes profits for the shop. It's worthy of immediate investigation.

BULLETIN ON REQUEST . . . *gives all details.*

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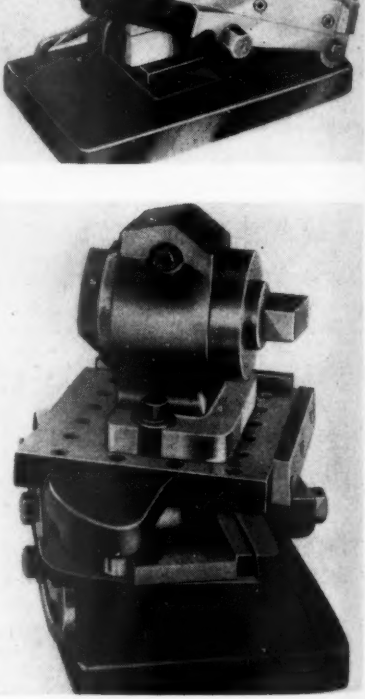
BRIDGEPORT 1, CONN.

Micro
Supreme
LAY-OUT AND IDENTIFICATION DYE
IN 12 COLORS
Red
Blue
Green
Brown
Black
Purple
Cerise
Yellow
Violet
Tangerine
Chartreuse
Aquamarine
Used for Both
★TOOL, DIE, PATTERN OR TEMPLATE LAYOUT ON METAL.
★QUICK IDENTIFICATION OF BAR STOCK, SHEET OR STRIPS, TOOLS, DIES OR PARTS.
DRIES INSTANTLY
QUICKLY, EASILY REMOVED
Circular giving full information and prices sent upon request.
MICHIGAN CHROME & CHEMICAL COMPANY
6350 E. Jefferson Ave. • Detroit 7, Mich.

Set Rotating Angle with Gage Blocks

The Roto-Sine plate which utilizes gage blocks to obtain angles of rotation is a product of Triangle Engineering Co., Dept. TJ, 410 E. Nine Mile Road, Detroit, Ferndale 20, Mich. Grinding,



milling, boring and inspection operations are readily applicable to this new tool.

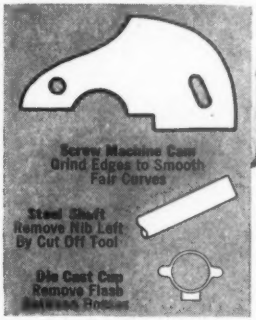
Both simple and compound angles are obtained by the use of sine tables and gage blocks. Angles of rotation are obtained without the use of graduations, simplifying efficient, accurate angle setups.

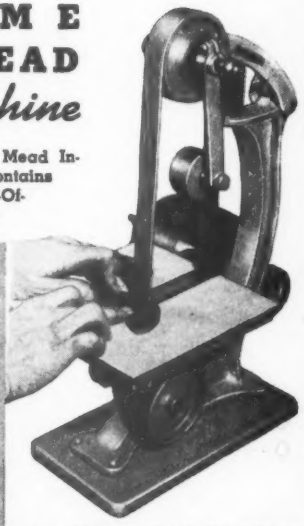
By charting setup blocks all angles can be easily reproduced when necessary to make more than one piece. The first

(TO PAGE 210—PLEASE)

18 WAYS TO SAVE TIME & MONEY *with the* MEAD *Industrial Burring Machine*

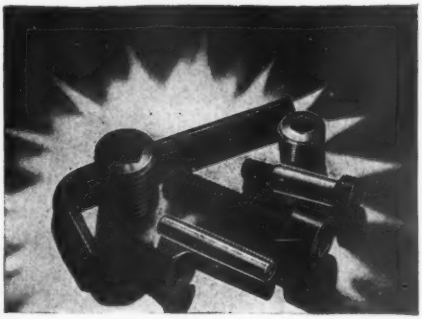
New circular explains, illustrates 18 ways in which the Mead Industrial Burring Machine saves time and money—also contains special Grit Guide. Every industrial plant needs this "Jack-Of-All-Trades" machine. Your burring can be done in "free time" — install these machines by every machine tool which leaves burrs. Grinds, finishes both outside and inside cut-out openings. Immediate delivery in most cases. Write for the informative Money-Saving circular now.





For METAL - PLASTIC - WOOD

MEAD Specialties Co.
15 S. Market, Dept. 114-H
CHICAGO 6, ILL.



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Don't Wait Months for

DIE SPRINGS
DOWEL PINS
SOCKET SCREWS

Send us that unfilled order, and we'll ship immediately from stock in most any size and quantity. Largest stock in the state of die springs, dowel pins, socket screws assures you prompt delivery. Give us one chance to prove that "We Deliver the Goods" is not just a slogan, but a fact. Send us one trial order. If we deliver, you gain. If not, you lose nothing.

DOWEL PINS are ground to tolerance of plus or minus .0001″. Standard plus ground .0002″ over listed diameters; oversize pins ground .001″ over listed diameters. In 38 lengths, from 3/8″ to 6″. In all diameters 1/8″ to 1″.

DIE SUPPLY COMPANY

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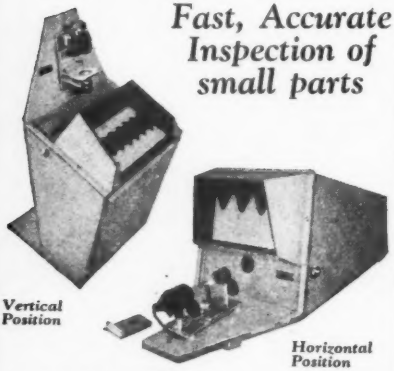
FS Optical Contour Comparator

Fast, Accurate Inspection of small parts



Vertical Position

Horizontal Position

Can be used in either horizontal or vertical position

Stage on which object is placed

With the FS Optical Contour Comparator you can make fast—but detailed—visual inspection of small intricate shapes such as screw threads, dies, gears, or parts of instruments, gauges, etc., checking their height, width, thickness, radius, etc., in a few seconds.

Accurate projection of the contour of the part being checked is instantaneous. An unlimited number of similar objects can be checked in rapid succession after one preliminary adjustment.

The Comparator's powerful aspheric condenser system and special lens produce an instantaneous accurate screen projection with a definite magnification of 24x. Other magnifications on special order. The unit is convenient, compact.

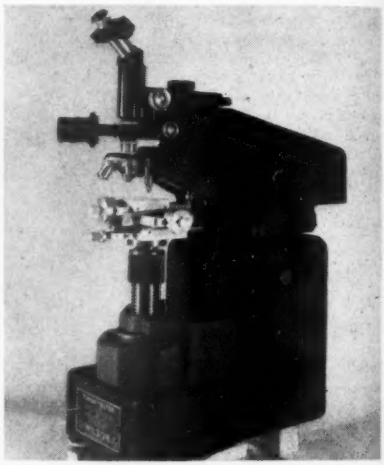
Write today for Bulletin OC-292.

FISH-SCHURMAN CORPORATION
230 East 45th Street, New York 17, N. Y.

Fish-Schurman

Tukon Tester

The Tukon Tester, developed especially for use with the "Knoop" Indenter and designed for determination of Knoop Hardness Numbers under testing loads of 25 to 3600 grams, is offered by the Wilson Mechanical Instrument Co., Inc., an Associate Company of American Chain & Cable Company, Inc., 383 Con-



cord Ave., New York 54, N. Y. This new method of indentation hardness testing requires minute, high precision penetrators and optical measurements of indentation to get precision hardness tests under lighter loads than are possible with the "Superficial" model Tester.

The "Knoop" Indenter is the invention of Frederick Knoop of the National Bureau of Standards. It is diamond in material and ground to a pyramidal form that produces a "diamond" or rhomb indentation having long and short diagonals of approximately 7 to 1. This permits hardness testing of extremely thin metal, plated surfaces, extremely hard and brittle materials, exceptionally shallow carburized or nitrided surfaces or where the applied load must be kept below 3600 grams or even as low as 25 grams.

The Tukon Tester is fully automatic under electronic control in a synchronous

(TO PAGE 210—PLEASE)

WHEELS THAT LEND WINGS!

Faster, better **BURRING, FINISHING, POLISHING** operations (as on the close-tolerance parts illustrated) are multiplied many-fold in industry by Brightboy . . . versatility unheard of in finishing operations. The soft rubber, binding the evenly distributed abrasive, does it.

Removing burrs, polishing base of elbow tube.

Ask your distributor or a Brightboy service representative how Brightboy can do your usual — and unusual jobs—present and planned-for. And ask for Brightboy prices, catalogs and production data.

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
Newark 7, N. J.

WELDON ROBERTS
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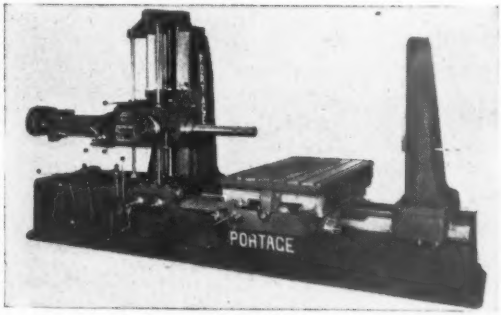
PORTAGE

4 INCH BAR HORIZONTAL BORING, DRILLING & MILLING MACHINE

ROTARY TABLES



ACCESSORIES

● Designed and built to meet the need for speed and accuracy demanded of today's production.

WRITE TODAY for fully illustrated bulletin giving detailed description of the many features of this Horizontal Boring, Drilling and Milling Machine. No obligation.

THE PORTAGE MACHINE COMPANY
555 Miami Street, Akron 11, Ohio

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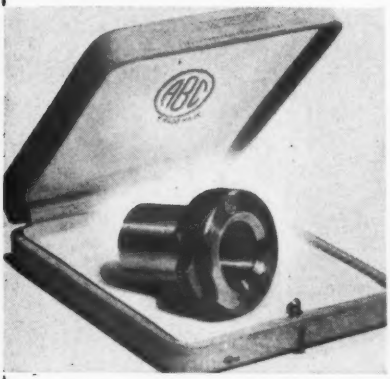

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BUSHINGS

Prompt Delivery from Stock

- HEADLESS PRESS FIT
- HEAD PRESS FIT
- FIXED RENEWABLE
- SLIP RENEWABLE
- HEADLESS LINERS

also

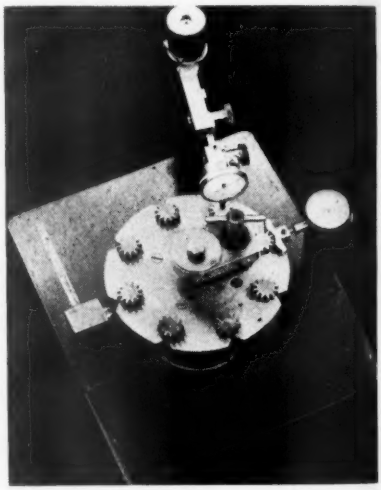
SCREWS • CLAMPS
LOCATING JIGS

Send for New Catalog No. 243

ACCURATE BUSHING COMPANY
447 NORTH AVE., GARWOOD, N. J.

Gages for Checking Pump Gears

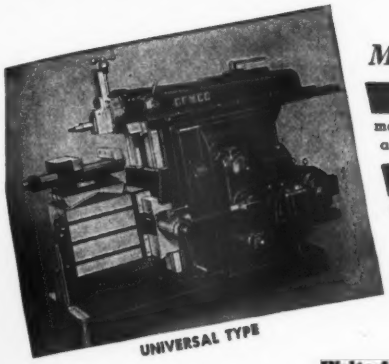
A simple gage and dial indicator setup for checking gears and gear teeth is in use at the East Springfield, Mass., shop of Westinghouse Electric and Manufacturing Co. Reported by B. T. Smith, Quality Control, the gaging unit is simple enough to be economical for checking a limited number of gears and requires no special skill beyond the ability to read a dial indicator.



The illustration shows the gage in operation checking pump gears for thickness of tooth section, major diameter of gear and for concentricity. All three dimensions are critical in the performance of the pump. The notching device locates each gear in turn for each checking operation. The "T" handle on the top of the gage operates a master gear which turns the gear being checked for outside diameter and for concentricity. These dimensions are read on the dial indicator at the right. The thickness is read on the indicator at the top of the photograph.

This type of gage, easily duplicated in any toolroom, solves a problem which usually is very troublesome.

Matched for the Job!



UNIVERSAL TYPE

GEMCO

Multi-Purpose SHAPERS

PLAIN TYPE A fast utility machine for a wide variety of the average shop work and for training purposes in industrial schools.

PRODUCTION TYPE Massively constructed with a large table to handle medium heavy work on a peak production basis with high limits of accuracy.

UNIVERSAL TYPE Ideal for tool and die work, experimental laboratories and model shops or where angular work set-ups are required.

Write for illustrated bulletin GC-12D.

Immediate Deliveries on Firm Orders!

GENERAL ENGINEERING & MFG. CO.
ST. LOUIS 4, MISSOURI

Manufacturers of Precision Equipment SINCE 1917

FASTER METAL CUTTING

KALAMAZOO *Metal-Cutting* BAND SAW

NO production slow-ups — or stoppages when you cut metal to lengths on this — easy handling — high speed — accurate — low cost — band saw. Automatic operation permits use of otherwise wasted time. Plugs in anywhere. Coolant attachment available for continuous cutting. A modern — labor-and-cost Saver.

• *Ask your dealer or write for bulletin* •

MACHINE TOOL DIVISION KALAMAZOO TANK & SILO CO. KALAMAZOO, MICHIGAN

BURKE
MILLING MACHINES

No. 4 Motor Driven MILLING MACHINE Mounted on Cabinet Column

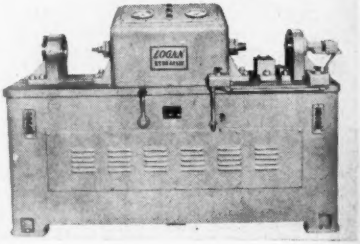
Burke motor driven milling machines Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

Write for complete information.

Burke Machine Tool Co.
301 E. 16th St. -:- Conneaut, Ohio

Hydraulic Gauging and Assembly Press

A hydraulic gauging and assembly press, especially developed and built for one of the leading manufacturers of aircraft engines, is one of the latest products of Logansport Machine Co., Inc., Dept. TD, Logansport, Ind. The machine has a dual function: the press fit assembly of a splined shaft into a splined hole of a disc shaped part at certain predetermined but adjustable pressures and the



disassembly for tear down inspection after green run of the engine.

The right hand side of the machine is for assembling, the left half for disassembling. Work holding fixtures with interchangeable locating bushings and collars for various work pieces are provided at each end of the machine, as well as interchangeable support blocks for the shaft being pressed in. The press has two independent hydraulic systems, each with a motor driven pump mounted on an oil reservoir, an adjustable pressure control valve, an operating valve and a hydraulic cylinder. The two cylinders have bores honed to a mirror finish. With accurately fitted pistons equipped with low friction piston rings, extremely low and uniform friction is obtained, giving the correct relation between working oil pressure and pressing force.

The control valve for assembling is operated through electric push buttons, the valve for disassemling through a hand lever. Adjustable snap action double pole pressure switches and a suitable contactor operate the controlling lights and stop the pressing stroke of the assembly cylinder when the press fit becomes too tight.

INFORM-A-GRAM KEY No. 372-R

CRITERION *Boring Heads*

Original Accuracy *Maintained*

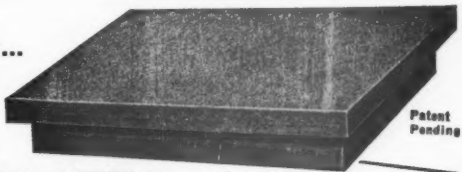
Noted for maintaining original accuracy over a longer period. Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

Lead Screw ground from solid AFTER hardening.

CRITERION MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

PUT THEM TO ANY TEST - RIGHT IN YOUR OWN PLANT...

HERMAN
Precision Granite
SURFACE PLATES



Patent Pending

Discover for yourself the advantages of HERMAN *Precision Granite* SURFACE PLATES—advantages that have made them the preference of scores of important plants engaged in important war work. We'll send you a sample plate, on approval, to be tested in your own plant. HERMAN *Precision Granite* SURFACE PLATES are positively accurate to .0001 overall; they're hard, smooth, warp-proof, non-magnetic, non-corrosive. Available in many sizes at reasonable prices.

Write today for descriptive folder, technical data, and a sample for test in your plant.

(Write for Comprehensive Report by Well-Known Technical Laboratory.)

A FEW TYPICAL USERS OF HERMAN GRANITE SURFACE PLATES

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General Motors
Chrysler Motors
Ford
General Electric
Westinghouse Electric
Allis-Chalmers
International Harvester
Curtiss-Wright
Crosley Radio
Bendix
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The Herman Stone Co.

1243 LEONHARD STREET, DAYTON 4, OHIO

MAKE
CRUSHER
ROLLS

OF
TOOL STEEL
TUBING

☆ The rolls shown above, for crushing hard, abrasive materials in a ceramic pulverizing machine, are made of 11" OD, 6" ID tool steel tubes. In service they have proved superior to every other type of roll which has been tried. This is one of many cases where tool steel tubing has saved time, money, manpower and metal.

WRITE NOW!

This free booklet describes seven applications of tool steel tubing, and suggests many more. Send for it!

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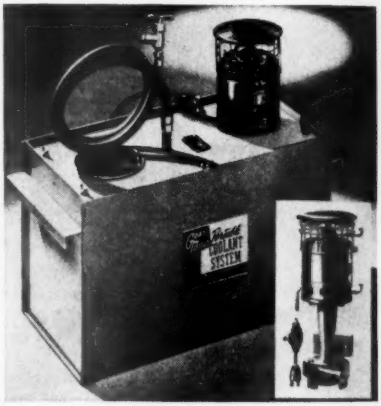
N.E. Steels and Standard S.A.E. Steels, both Carbon and Alloy. Hot Rolled and Cold Drawn • Chisel Steels • Cumberland Ground Shafts • Drill Rod • High Speed Steels • Shim Steels • Tool Steels.

BISCO

THE BISSETT STEEL CO.
945 EAST 67th ST., CLEVELAND 8, OHIO

Portable Coolant System and Pump

A new unit, Model 1130, a portable coolant system and centrifugal pump, is announced by the Gray-Mills Company, Dept. TD, 1951 Ridge Ave., Evanston, Ill. The new model, compact enough to fit under a machine or in any convenient adjacent space and furnished ready for immediate plug-in operation, is particularly suited for the application of coolants to grinders, cut-off saws, milling machines and such operations as fine abrasive cutting and honing.



Model 1130 is simple, compact and sturdy. Little maintenance is necessary; lubrication points are readily accessible. Forced-settling baffle plates are built into the tank to reduce circulation of solids. The new Gray-Mills 1100 Centrifugal Pump has a capacity of 1200 gph (water) at 0 head and 360 gph at 5' head. Flow is adjustable from a trickle to a full stream. Abrasives or chips pass through the pump without binding or abrading.

The G-M 1100 pump is also designed for in-built coolant systems and as a general purpose pump for sump and other uses. The mounting bracket permits either vertical or horizontal attachment or the unit may rest on its own 3-leg base. Complete details and specifications are available from the manufacturer.

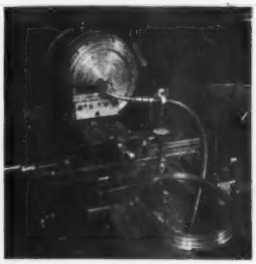
INFORM-A-GRAM KEY No. 555-R

NEW AND REVOLUTIONARY

MAGNETIC CHUCKS

FOR

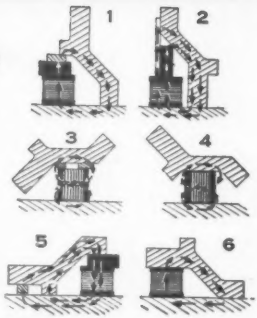
TOOL ROOM AND PRODUCTION



Following the arrows will quickly show how you may utilize the new Magnetic Circuit of our POWER-GRIP Chuck on surface grinders. The combinations of blocking, shimming, etc., are only limited by the operator's experience and imagination. The holding power lost through the various blocks is negligible.

On a 10" cast iron ring, in Detroit—"We are pleased to say this has meant a 300% increase in production and a 5% decrease in scrap to this item."

Square Tool, Die & Mfg. Co.
(Signed) W. JACKSON,
Factory Manager.



Furnished complete with combination Power and Control Unit for 110 Volt A.C. Circuits, from stock

ROCKFORD MAGNETIC PRODUCTS CO.

1019 Sixth Avenue, *(Card brings Catalog)* Rockford, Illinois

C-F POSITIONERS

In Any Welding Operation It's "Position" That Counts

Production welding usually means working on top, bottom and on all sides of the weldment. It means a "quick change" of position should be possible for greater time saving, more efficiency, lower costs and greater safety to men and materials. With C-F positioners a welder can quickly position even the most cumbersome weldments at the press of a button, without crane help or handling crews. With just one set-up of the weldment, he can position it easily, speedily and safely, all alone. He can rotate it a full 360° at variable speeds from 0 R.P.M. up, tilt it to 135° beyond horizontal, and can weld, downhand, all sides, surfaces and angles in the one set-up with larger rods and fewer passes. All C-F positioners, both stationary and portable, are pedestal mounted to give maximum floor and working clearance and all are adjustable for height.

Write for Bulletin WP-22

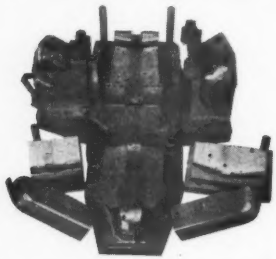
CULLEN-FRIESTEDT CO.

1316 S. Kilbourn Ave. Chicago 23, Ill.

WHISPERING CAMPAIGN

Word of mouth travel has built up a list of almost 1,000 users of Strenes metal ranging over 36 states and employing this unusual alloy in many ways.

Its principal use is for drawing and forming dies . body tops, fenders, radiator grills, hoods, lamps . . . refrigerator tops,



sides, doors, trays . . . stove parts, tractor parts, farm implement parts, caskets, grave vaults, etc.

Strenes can be cast very close to shape (usually 1/16") . . . thereby greatly reducing machining time. Its graphitic lubrication rate is very high, hence runs of 1,000,000 deep draw parts are not unusual.

Here is an alloy you should look into and we are ready to cite hundreds of plants for you to contact on the subject.

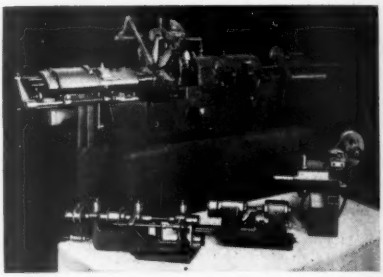
Also . . no matter how extensive your tooling program Advance has the capacity to handle the casting end and give you excellent service.

THE ADVANCE FOUNDRY CO.

DAYTON 3, OHIO

New Attachments for Wickman Automatics

A new set of five attachments which increases the range of work that can be handled on the Wickman No. 2 Swiss Type Automatic is announced by The Wickman Corporation, Dept. TD, 15533 Woodrow Wilson Ave., Detroit 3, Mich. The attachments include a three spindle attachment for multiple operations and separate attachments for high speed drilling, threading, slotting and taper pin turning.

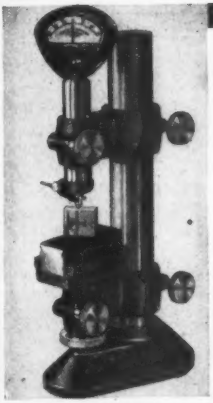


The Wickman Three Spindle Attachment, shown on the machine, may be used for drilling, centering, threading, reaming or tapping. Two plate type cams control indexing; feeds are controlled by a sleeve type cam. One spindle is non-rotating and used for centering and drilling; a second spindle, used for drilling or reaming, may either rotate in the opposite direction from the machine spindle or be held stationary; the third spindle overruns the machine spindle for precision threading.

The High Speed Attachment, center, consists of a sliding head rotating in the opposite direction from the machine spindle, may be used for drilling and centering operations. The Threading Attachment, left, a hollow spindle with a sliding head that overruns the machine spindle, performs precision threading operations with Self Opening Die Heads.

The Slotting Attachment, right, slots or mills the end of any part produced on the Wickman No. 2 Automatic. A pickup arm reaches down, grasps the part as it is being cut off, carries it to the slotting saw where it is slotted and auto-

(TO PAGE 202—PLEASE)



Made in 4 SIZES

MIKROKATOR "MIKRO" (MINUTE) FRICTIONLESS AMPLIFICATION

Complete elimination of friction, lag, and backlash insures positive, dependable repeat readings. Pointer responds instantly to the slightest movement of measuring tip; no swinging past true reading, no waiting for pointer to come to rest. No lights or electro magnets, no warm-up period required. No electrical connections, can be readily moved to different locations. GRADUATED: .0001" to .00001", .001 mm to .0002 mm.

RAPID
RELIABLE
SENSITIVE
LIGHT
COMPACT
STURDY

SWEDISH GAGE CO., OF AMERICA
8900 ALPINE AVE., DETROIT 4, MICH.

MEAD *Presents the* AIR PRESS

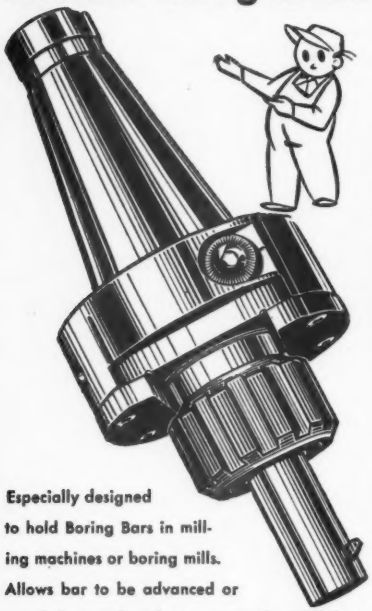
These new Mead Air Presses deliver 400 and 1200 lbs. pressure respectively on 100 PSI. Handle many staking, crimping, assembly, and similar operations. Clearances 4" and 7½" respectively. With foot control these presses will speed up countless bench jobs, save muscular effort. Write for new Air Power Catalog — just off the press.

MEAD SPECIALTIES COMPANY
15 SO. MARKET STREET DEPT. 114-HA CHICAGO 6, U.S.A.

(CONTINUED FROM PAGE 200)

matically ejected into a work tray. The Taper Attachment is used for making long, extremely accurate tapers, transferring the taper from an accurately ground form bar to the No. 1 tool.
INFORM-A-GRAM KEY No. 526.5-R

Universal Boring Chuck



Especially designed to hold Boring Bars in milling machines or boring mills. Allows bar to be advanced or receded to a length to suit work. Will bore holes to a tolerance of .0005. Can be adjusted to compensate for wear. Made in two sizes to accommodate bars from ⅜" to 1" with milling machine taper or Morse taper shanks. Write for catalog.

Buttress Tooth Saw Blade Frees Chips

The new DoAll Buttress Saw, designed with greater tooth spacing for more rapid removal of material, less generating of heat and the production of smoother cuts, is announced by The DoAll Company, 234 North Laurel Ave., Dept. TJ, Des Plaines, Ill. The new blade design gives long life and versatile cutting applications—ferrous and nonferrous alloys, woods and plastics materials, all are within the efficient working

range of the Buttress Saw. War materials including aluminum, magnesium, kirksite and aircraft and ordnance plastics materials, as well as alloyed steels, are machined with dependable accuracy.

Tooth gullets are elongated to provide plenty of room for fast chip removal, assuring cool continuous cutting. The design permits rapid production, parallelism and close tolerance over the entire finished cut. Teeth are securely anchored to withstand shock and are made fast in their precision set position by means of accurately controlled heat treatment.

The DoAll Buttress Saw does away with costly resetting and resharpening. High carbon steel is used to impart abrasive resistance into the sharp cutting edge of the teeth. The smoothness of cutting reduces operator fatigue. The Saw is manufactured in widths of ¼" to 1" and with various sets and pitches.
INFORM-A-GRAM KEY No. 130-R

simplified grinding

with **PARKER-MAJESTIC**
Internal and External Grinders

For precision grinding . . . internal or external . . . Majestic simplicity of design and flexibility of changeover guarantee maximum grinding output at low cost.

Send for descriptive circular..NOW!

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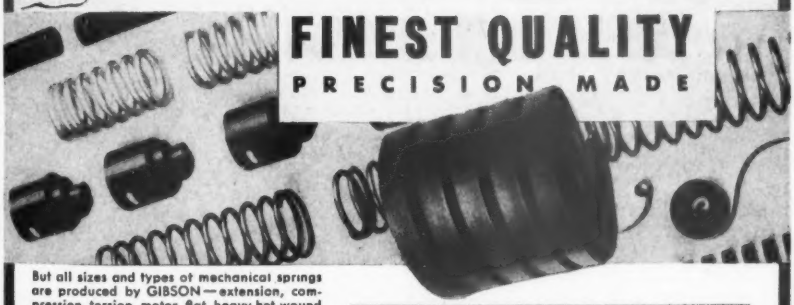
2930 EAST WOODBRIDGE • DETROIT 7, MICHIGAN

All Kinds of Springs
NO! Just 1 Kind-

FINEST QUALITY
PRECISION MADE

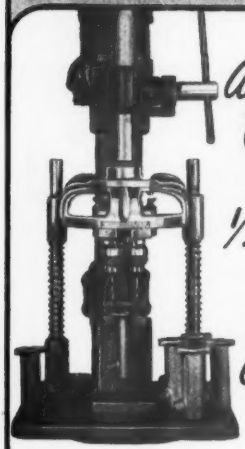


But all sizes and types of mechanical springs are produced by GIBSON—extension, compression, torsion, motor, flat, heavy hot-wound springs, clips, clamps, wire forms, etc., from standard and special spring materials. What are your requirements? Inquiries invited.

GIBSON-SPRINGS

THE WILLIAM D. GIBSON CO. 1800 CLYBOURN AVE., CHICAGO 14, ILL.
(DIVISION OF ASSOCIATED SPRING CORPORATION)

TWO SPINDLE
Adjustable
DRILL HEADS
Drill Two Holes At Once



✓ *Adjustable Centers from ½" to 6"*
✓ *Drill Capacity 0 to 5/8"*

Sleeve and overarm types ... in several sizes. Will double output of any single spindle drill press.

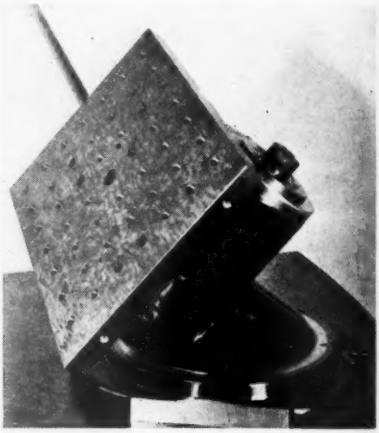
Quickly adjusted to desired drill centers from ½" to 6".

Send for bulletin

LINDERME
MACHINE & TOOL CO., INC.
12250 COYLE AVENUE
DETROIT 27, MICHIGAN

Universal Compound Angle Plate

The new model "E", Universal Compound Angle Plate, a versatile tool for accurate and fast setting of work to angle and compound angles is announced by The Angle Computer Co., Dept. TD, 5720-22 Melrose Ave., Los Angeles 38, Calif. The Plate is practical for many uses including layout, and inspection.



The Universal Compound Angle Plate may be tilted 90° in two directions from a position parallel to the base and may be rotated 360° about the base. The surface plate will move in three planes, each of which has its own locking unit, so that the plate can be moved in any one plane with the other two locked.

Three protractors graduated in half degrees and verniers graduated to one minute and with an accuracy of within 10 seconds of the arc assure accurate calibration.

All castings are of normalized, very close structure iron alloy. The surface plate, approximately 11" x 12" x 1⅜" is hand scraped and flat to within .0002". The base plate has a construction pad on each side. These are machined and ground parallel with the ½" x ⅜" keyway and can be used for alignment of the plate on a machine, or the work on the plate or from a bench surface plate when used as an inspection tool or for layout work.

INFORM-A-GRAM KEY No. 100.5-R

Newton AUTOMAT

Available now for SOUTH BEND, LOGAN, ATLAS, CRAFTSMAN, SHELDON, CLAUSING, and similar lathes.

Converts

HAND-OPERATED TURRET LATHES INTO RELIABLE AUTOMATICS . . .

PRICE $295

HERE is relief from manpower shortage and losses from rejects incurred by operator inexperience and fatigue—a practical, highly efficient means of greatly increasing output and profits, easily installed on any bench lathe. The unit is very simple in design and of rugged, enduring construction—as foolproof as a mechanical device can be. The set of standard cams will handle almost any job. The member which actuates the cross slide is a torque rod which cushions the shock of forming and cut-off operations, assures uniform feed and accurate repeating, prolongs tool life. An automatic cut-out, quickly adjustable to work of different character, reduces tool spoilage and parts rejection. A Schrader-engineered three-way valve operates any collet closer. Put this easily installed, money-making unit to work for you now. It will pay its cost in less than 30 days!

NEWTON MANUFACTURING COMPANY

706 North Heliotrope Drive • Los Angeles 27, California

When we turn the page, Master Gauge will be ready with

GAUGES DIES JIGS FIXTURES

Prompt Delivery on Thread Plug Gauges

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Use Them Over and Over

DE-STA-CO ARBOR SPACERS

Measured by the number of times De-Sta-Co Spacers can be used, they are the lowest in cost of any spacers you can buy.

Made of metal, they are not affected by oil or heat.

Use for quick set-up of milling machine cutters and wherever low cost, accurate spacing is needed. Stock sizes .001″ to .125″ thick. Specials, any length, cut from bar stock, ground to decimal.

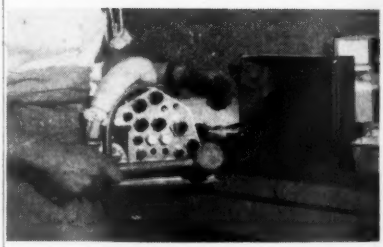
TRIAL ASSORTMENT—enough for average use on one machine sent for $1.00. Give arbor size.

Size and price list sent FREE!

DETROIT STAMPING CO.
Established Over 25 Years
344 Midland Ave • Detroit 3, Mich.

Plastic Caps Protect Hydraulic Tubing

The development of successful plastic caps to cover the open ends of tubing in shear beam plumbing assemblies and other elements in the hydraulic system



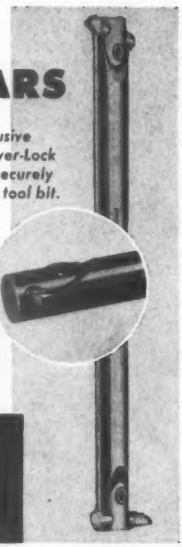
of the Lightning P-38 fighter while in storage, has contributed to safety in flight according to Val Lehmann, Lockheed manufacturing engineer. "It is necessary to keep these tubing ends covered during storage," Lehmann stated, "Otherwise, dust would collect inside the tubing and more often than not cause the ship to crash. One grain of dust under a relief valve might not allow the hydraulics system to operate. The result might be that the pilot would be unable to get his landing gear down, or perhaps his oxygen supply would be cut off or his fuel line would be fouled. The proper capping of these tubing ends is

(TO PAGE 212—PLEASE)

Clark
LEVER-LOCK BORING BARS

1. Sizes down to 3/16" diameter.
2. Eliminates use of solid forged bars.
3. Tool bit held on extreme end of boring bars.
4. Full clearance to bore or thread to bottom of blind hole.
5. Each bar has 15° holding channel in one end, right angle channel in other.
6. One precision ground thread tool bit and one boring bit furnished with each bar.
7. Complete set of 4 packed in sturdy wood box $8.70.

The exclusive Clark Lever-Lock feature securely grips the tool bit.



SPECIFICATIONS			
Dimensions of Boring Bars		Size of Cutters Round	Used with Clark Tool Holders Nos.
Diam	Lgth.		
3/16	5	3/32	P60R, P61R
1/4	6	1/8	P60R, P61R, P62R
3/8	7	3/16	P61R, P62R, P64R
1/2	8	1/4	P62R, P64R

Write for catalog TDJ-11

CLARK CUTTERS

Robert H. Clark Company

Industrial District • BEVERLY HILLS, CALIF.

ROTO-SINE
TRADEMARK

NO LONGER NECESSARY TO OBTAIN ANGLES OF ROTATION FROM GRADUATIONS

FOR BORING, DRILLING AND MACHINING SIMPLE OR COMPOUND ANGLES

Roto-Sine uses new method of obtaining both single and compound angles. By use of gage blocks, Roto-Sine provides accurate, quick means of obtaining angles of rotation without use of graduations. Every tool shop will find Roto-Sine the answer to efficient, accurate angle set-up.

Available in 5 inch and 10 inch models.
Table sizes—

5" Model H—5½ x 6
10" Model B— 7 x 12
10" Model C—10½ x 12

PRICES AND DELIVERY DATES ON REQUEST

PRODUCTS DIVISION

TRIANGLE ENGINEERING CO.

DESIGNERS OF

TOOLS • DIES • GAGES • SPECIAL MACHINES AND PRODUCT DESIGN

410 E NINE MILE ROAD DETROIT, FERNDALE 20, MICH.

STA-KOOL
DIAMOND DRESSER

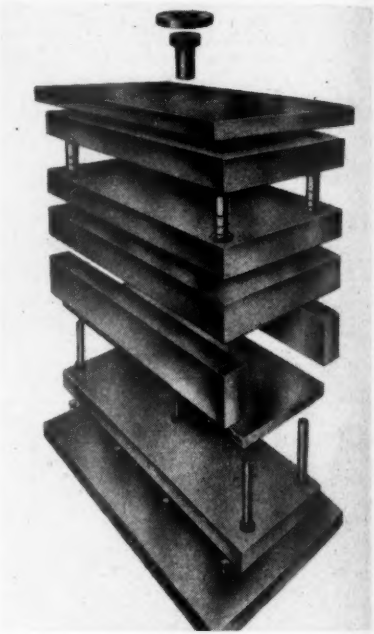
This new, patented diamond tool holder provides a fast, accurate method of meeting every requirement in dressing and truing operations. Equipped with internal coolant ducts for wet grinding, and external cooling fins for dry grinding, metal setting as well as stone are kept at safe operating temperatures, eliminating diamond breakage, due to overheating. Thus, tool life is increased, resulting in savings from 30 to 50%.

Catalog on request.

J. K. SMIT & SONS
157 Chambers St. New York 7, N.Y. 6400 Fireman Ave. Detroit 10, Mich.

New Large Size Mold Bases

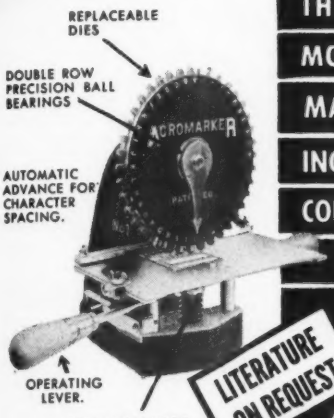
A new and larger sized set of prefabricated parts for plastic mold bases providing more cavity area in a standard mold set, is announced by the Detroit Mold Engineering Company, Dept. T, 4839 Woodward Ave., Detroit 1, Mich. The new set of parts, to be known as the



55-S Series complements D-M-E's established line of standard mold bases.

The S Series, as shown, is 23½" long and 12" wide and gives the mold maker a complete set of parts with which to build up mold bases. All surfaces of the cavity retainer plates are ground and the leader pins and bushings are installed. Other parts are machined to close tolerances. Sprue bushings, return pins, dowels and screws of proper length and size are furnished with the set. The S Series like the other mold building elements in the line save both the designer and mold maker time and expense and eliminate costly errors so often encountered in the making of a custom-built mold base.

INFORM-A-GRAM KEY No. 264-R


REPLACEABLE DIES
DOUBLE ROW PRECISION BALL BEARINGS
AUTOMATIC ADVANCE FOR CHARACTER SPACING.
OPERATING LEVER.
TABLE LIFTS UP TO DIES, 3/32" LIFT. TABLE ALSO MOVES LEFT OR RIGHT, ALSO IN AND OUT FOR LINE SPACING.
ACROMARKER

THE ACROMARKER FOR FASTER MORE EFFICIENT AND PERMANENT MARKING, NUMBERING AND STAMPING OF NAME PLATES, OR FILLING IN CODE LETTERS OR KEY SYMBOLS ON METAL, PLASTICS, FIBRE OR MISCELLANEOUS MATERIALS.

LITERATURE ON REQUEST

ACROMARK

MARKING AND STAMPING SPECIALISTS

5-15 Morrell Street, Elizabeth, New Jersey

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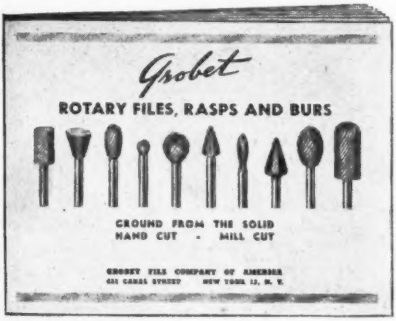
Grobet
ROTARY FILES, RASPS AND BURS
GROUND FROM THE SOLID
HAND CUT - MILL CUT
GROBET FILE COMPANY OF AMERICA
421 CANAL STREET NEW YORK 13, N. Y.

• *Just off the press* — the most complete of its kind, illustrating the full line of GROBET ROTARY FILES, CUTTERS, DIESINKER'S BURS, etc., in size, shape and coarseness of cut for every industrial purpose.

(Please make your request for "Catalog YR" on your firm letterhead)

GROBET FILE CO. of AMERICA

421 Canal Street — 1812 F. L. GROBET — New York 13, N. Y.

IMPORTERS OF GROBET SWISS FILES — MFRS. OF GROBET ROTARY FILES

PLANTS: NEW YORK, CHICAGO, LOS ANGELES

Reg. U.S. HY-PRO Pat. Off.

TAPS

These high production taps produce consistently more accurately threaded pieces to lower the cost of your tapping operations.

Precision ground from the hardened solid of high speed steel, HY-PRO tap tolerances are held to extremely close limits. *Accurate tapping assures tighter, stronger fastenings that defy vibration!* Specify HY-PRO for High Production.

Commercial and Precision Ground Thread Taps

•

Special Ground Thread Taps

Write for Catalog on Company Letterhead

HY-PRO TOOL CO.
New Bedford, Mass., U.S.A.
489 Mt. Pleasant St. BUY BONDS

Plexiglas Bell Cap Center Punch

A bell cap center punch with the bell cap of transparent Plexiglas has been developed by the Curtiss-Wright Corporation for centering holes in template work and for providing a drill point at the necessary 90° angle to the surface.

The ability of the operator to position

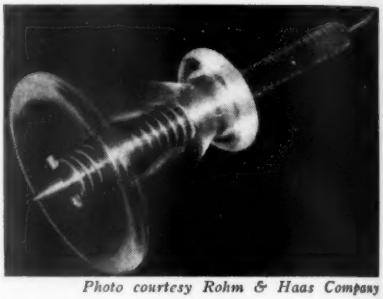

Photo courtesy Rohm & Haas Company

the point visually and to accurately align punch holes in work on both flat and concentrically contoured surfaces speeds the work of skilled workers and reduces reworking and scrap.

Plexiglas, practically unbreakable and actually clearer than glass, may be sawed or carved like wood and machined, drilled and threaded like any soft metal. The bell center punch, in the Curtiss-Wright shops, has greatly reduced misaligned and mismated holes.

★

(CONTINUED FROM PAGE 190)

illustration shows gage blocks in use in the setup of a compound angle. The second shows the Roto-Sine with attachment for tool bit grinding, the angle of rotation made with a gage block.

INFORM-A-GRAM KEY No. 496-R

(CONTINUED FROM PAGE 192)

cycle. The specimen is mounted and placed on a "Microton" (a micrometer stage with 2-way adjustment for horizontal movement of specimen), and elevated against the "Knoop" Indenter, until the specimen's hardness resists further indentation. At this point the elevation automatically stops, the load is held for a fixed period, then the specimen is automatically lowered and ready for the microscope.

INFORM-A-GRAM KEY No. 676-R

IMPROVED TAPPING HEAD

Cross section of Tru-Grip Tap Holder showing positive drive to tap.

BETTER DESIGN GIVES — ● Increased Output ● More Accurate Work ● Less Tap Breakage

The Tru-Grip Tap Holder, for instance, weighs one-third as much as conventional chucks, which kills fly wheel effect and promotes more accurate tapping. The tap holders have small outside diameter: ¾" for No. 1, 1" for No. 2, 1⅜" for No. 3—which permits use of tapping head in hard-to-get-at spots. Shank is one piece, heat treated and precision ground. Tap is driven by square and held true by the round. Many other features include: Dry, double-cone friction clutch that won't wear and can't absorb oil; makes bottom tapping easy; ball bearings; three point balanced, heat-treated gear reversing mechanism which distributes pull and greatly reduces strain.

PROCUNIER SAFETY CHUCK CO.
12-14 S. Clinton Street
Chicago, Ill.

SEND ME BULLETINS ON:

- ☐ High Speed Tapping Heads
- ☐ Tru-Grip Tap Holders
- ☐ Universal Tapping Machines

Name.....

Address.....

UNBRAKO

SOCKET CAP SCREW *with the knurled head*

WHEREVER IT'S KNOWN, IT'S LIKED

Knurling of Socket Screws originated with "Unbrako" years ago

. . . for its knurled head

which provides a slip-proof grip — screw can be turned farther and faster by hand before a wrench is needed. Aids in making adjustments with pliers.

. . . for the accuracy of its threads

which deters it from working loose — and makes every thread carry its share of the load.

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which permits the "Unbrako" to be tightened up much harder and in less time than an ordinary screw could be. *Send for the "UNBRAKO" catalog.*

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(CONTINUED FROM PAGE 206)

therefore one of the most important things that an aircraft manufacturer must do to guard against failure of the hydraulics system in flight. This has been done in several ways in the past, but never so easily, quickly and economically as by use of the plastic caps."

The caps, patented and manufactured by the Southern California Plastic Company of Eagle Rock, Calif., were designed by S. J. Grey and Jack Rosser, engineers for that company, with the assistance of Lehmann.

The caps are made in three styles to cover the three types of openings to be capped: (1) a snap on cap, for use on beaded ends of tubing; (2) snap on plugs, for use on flared tubing ends; (3) quarter lock caps, for use on male fittings, particularly on hydraulic assemblies, i. e., the shear beam assembly located in the leading edge of the P-38 center section. All caps are made of Tenite II, the Tennessee Eastman Company's cellulose butyrate.

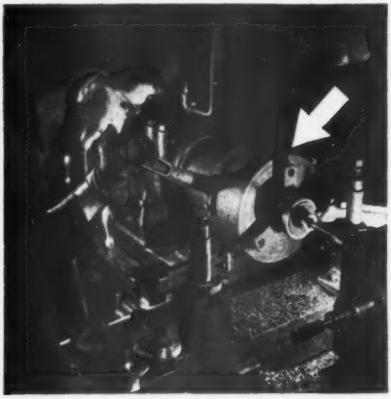
The caps or plugs are attached to the tubing ends by hand, occasionally followed by a light tap with a wooden hammer. They are quickly removed either with the fingers or by a pair of pliers when necessary.

The first illustration (see page 206) shows Mr. Lehmann about to cap a flared tubing end with a snap on plug. The rod he holds in his right hand is capped with a snap on cap.

The caps and plugs are molded in color for size and identification. Sizes in quarters of an inch are in red, in eighths of an inch in ivory and in sixteenths of an inch in blue. In addition, caps and plugs are numbered as to the size of the tube they are to fit. Caps range from ⅛" to 1¼" OD.

The second illustration shows the method of capping tubes grouped in close quarters with quarter lock caps. The P-38 shear beam assembly is shown. The term "quarter lock caps" no longer is accurate since the quarter turn originally required to cap this style is no longer required.

The plastic caps and plugs are practically indestructible and average 80% reclamation with routine sorting and washing. The Lockheed plant at Burbank, Calif., uses nearly one million of the plastic caps each month.



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Barker Wrenchless Chuck—two-jaw type.

Pieces-per-hour went up and stayed up when this P&J Automatic Lathe was equipped with a Barker Wrenchless Chuck. Top output before the change was 18 pieces—the Barker Chuck stepped up production to 24 pieces—an increase of one-third. This user operates six Barker Chucks that are giving uniformly efficient service.

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- "P—¼ x 13/32 x ¾" would mean "Press Fit bushing .2501 —.2504 I. D. x .4075 — .4078 O. D. x ¾ long."
- "S. R. — 11/32 x ¾ x ½" would mean "Slip Renewable bushing .3438 — .3442 I. D. x .7498 — .7500 O. D. x ½" body length."

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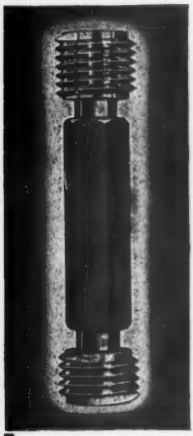

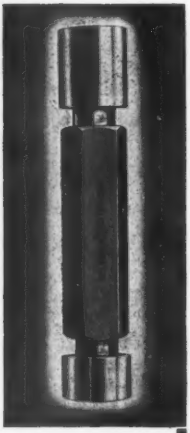

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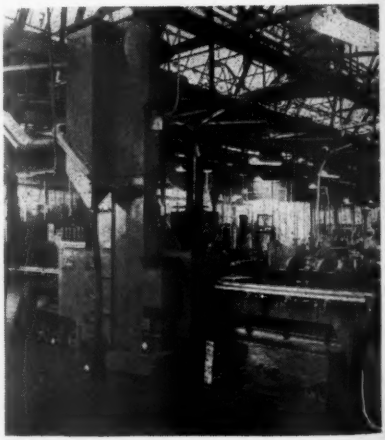
Shot Peening and The Fatigue of Metals

The result of many months' laboratory research, a study titled "Shot Peening and the Fatigue of Metals", by H. F. Moore, for many years Research Professor of Engineering Materials at the University of Illinois, has been published by American Foundry Equipment Company, 555 S. Byrkit St., Mishawaka, Ind. Among the subjects covered are: Types of structural damage of metals; how shot peening increases resistance to plastic distortion; the origin of fatigue cracks; the effects of cold working; measurement of shot peening intensity; examples of increased fatigue life from shot peening and many others. The booklet is illustrated by microphotographs, charts and tables, and contains research data never before published.

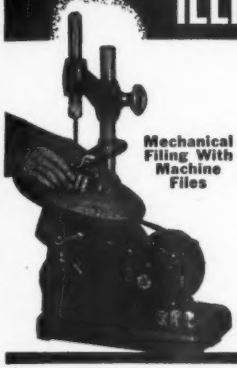
To increase the life of stressed parts the American Foundry Equipment Co., has developed a line of machines, known as Wheelapeening equipment, in which a rain of metallic shot is directed against the part at high velocity. Each shot striking the surface makes a tiny dent or pit, so that the cumulative effect is to stretch the surface layers by cold working, to put them in a state of residual compression. And since failure occurs under tension stresses, never under compression stresses, fatigue cracks do not get a chance to start.

With the Wheelapeening machine il-

(TO PAGE 216—PLEASE)



ILLINOIS DIE FILING MACHINE



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A versatile bench type machine for all three major production steps in the die-making process—sawing, filing and stoning. Quality built throughout to stand up longer and produce more accurate work. Forced-feed lubrication plus hardened and ground shafts running in bronze bushings combine to minimize wear and prolong life. Maintained accuracy is secured through holding chuck and clamping device which provide positive file alignment, and balanced moving parts which operate without vibration. *Write for descriptive literature.*

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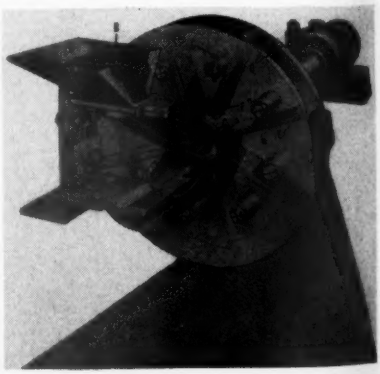
(CONTINUED FROM PAGE 214)

lustrated, torsion bars (which take the place of conventional springs in tanks, buses and trucks) are placed on skewed-dished rollers which convey the bars through the machine and impart a rotary motion so that all surfaces of the bar are exposed to peening action. Inside the machine, a Wheelabrator (airless, centrifugal blast unit) hurls a rain of shot at high velocity onto the surfaces of the torsion bar. Other models of Wheelapeening machines are available to give different combinations of motion for peening parts of various shapes and sizes.

The Wheelabrator, as illustrated, is a mechanical unit that utilizes controlled centrifugal force instead of compressed air for throwing shot upon the work. It is completely airless, therefore it eliminates costly compressed air generating equipment. Shot is fed to the center of the bladed wheel from an overhead storage hopper whereupon it is hurled by centrifugal force, under perfect control, upon the work to be peened. An impeller (G) rotates with the wheel proper and carries the shot to an opening in the stationary control cage (F) where it discharges to the bladed section of the wheel. At this point the shot is picked up by the inner ends of the throwing blades (E) and is gradually accelerated in its passage to the periphery of the wheel. The final throwing velocity is the result of radial and tangential forces. Change in direction of the blast stream is obtained by turning the control cage which changes the position of the opening.



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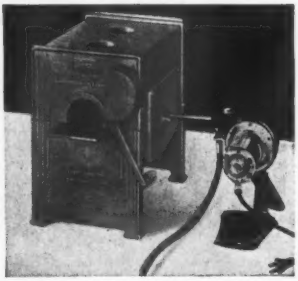

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"ELECTROBLAST" will save time, fuel and rejected work. It requires no compressor or piping. Heats work indirectly. Muffle dimensions 7 x 3⅛ x 2⅛". Price $70 as shown. Also a larger furnace 7 x 4⅝ x 3½".

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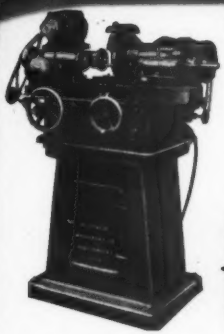
Originators of the American Bench Lathe



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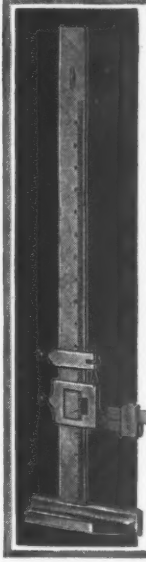

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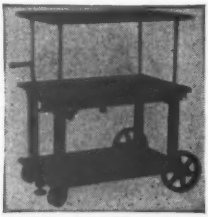

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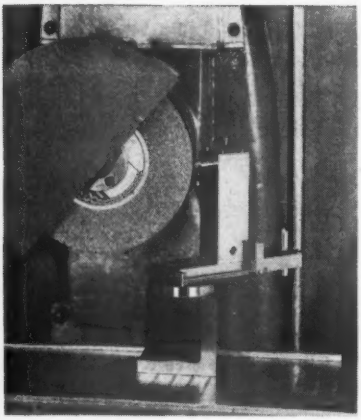

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Specifications: Base 3"x 3", Height 8½"; Wheel capacity 10"; Angular travel 3".

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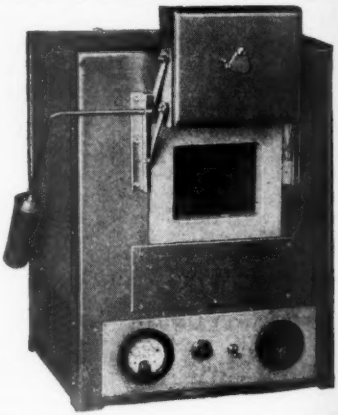
New Electric Furnace by Thermo Electric

A new electric furnace, providing temperatures up to 1850° F, and incorporating several unusual features of design, is announced by the Thermo Electric Manufacturing Company. Known as the Model OFE, this new furnace will find wide application for heat-treating tools and dies and for other general industrial and laboratory use.

The front of the furnace is formed of heavy steel plate, rounded at corners, and has an instrument panel built right into the base. Construction features a heavy steel, welded frame, with transite sides, and with 4¾" of insulation around the heating chamber. The heating element is of highest quality nickel chromium alloy in coiled form, which completely surrounds the four sides of the muffle core.



A welcome feature of this new furnace is the door arrangement. Instead of being hinged at the bottom or suspended on a cable, the door is supported by two sets of parallel levers, so that when opened it moves upward and out of the way. It is heavily insulated and, being properly counterbalanced, operates very easily.

Close heat selection is provided by an input controller, mounted on the instrument panel, which automatically turns the current "on" and "off" for any desired portion of a one minute cycle. No external rheostat is required, and since

(TO PAGE 230—PLEASE)

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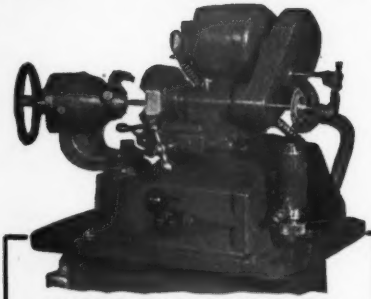

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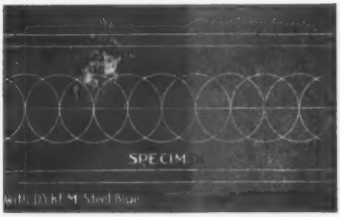

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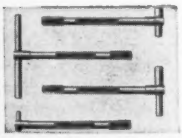
are precision ground—all parts subject to wear are hardened—ground to proper radius.



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AA	.4" to ½"	$2.10
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Set of 3 (A,B,C) w/case 7.30

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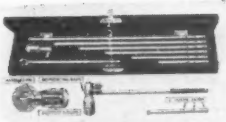

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To avoid costly production lags caused by parts shortages, keep your tool crib well stocked at all times with Dowel Pins, Springs, Screws, Stripper Bolts and other accessories. Producto accessories are shipped from five key stock and assembly points conveniently located to major tooling centers. In addition, many sales offices also carry Producto accessories. For die and fixture making stock up with Producto Die Sets and accessories. Specifications and price list sent on request.

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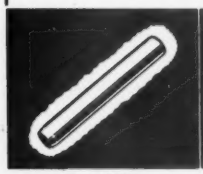
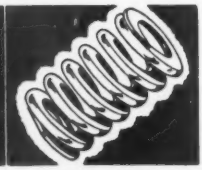
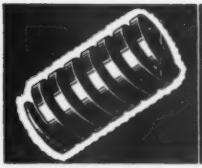


Dowel Pin



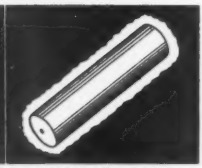
Oval Wire Spring



Square Wire Spring

Socket Head Cap Screw

Socket Head Stripper Bolt



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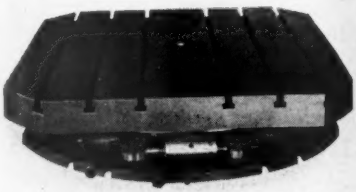
Portage Rotary Table Cast of Meehanite

A new rotary table to be used in connection with their horizontal boring, drilling and milling machine has been developed by the Portage Machine Co., of Akron, Ohio. Tables 36″ x 36″ or 48″ x 48″ are produced. Positive positioning at any point is assured with half degree graduations. Fixed bushings at



90°, 60°, 45°, and 30° points are provided.

The table pivots on roller bearings and is cast in Meehanite to assure rigidity and maintained dimensional accuracy. The base of the table is provided with hardened keys in order to permit easy alignment on the boring mill table. As an accessory the table allows a number of operations with a single clamping, eliminating the necessity of making numerous set-ups.

INFORM-A-GRAM KEY No. 388-R

★

Erie Custom Injection Molded Plastics

A 12-page booklet, "Erie Custom Injection Molded Plastics" issued by the Plastics Division, Erie Resistor Corporation, Dept. TD, 642 West 12th St., Erie, Pa., outlines the facilities and pictures many parts designed and molded in this leading custom shop. The work of the design and engineering department, such processes as "Three Dimensional" plastics and finishing operations, including decorative painting and stamping, are given in some detail. One section is given over to a description of the extrusion molding done by this company which is a large producer of Erie Plastic Tubing for many industrial applications.

A copy of the booklet will be sent on request.

INFORM-A-GRAM KEY No. C7-R

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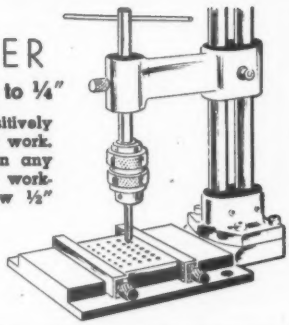
SENSITIVE HAND TAPPER

for hand tapping of delicate threads, from #0 up to ¼"

This handy device is precision-built and jig-bored and will positively eliminate expensive tap breakage or spoiled holes on costly work. The lapped spindle and guide assures perfect alignment in any position of the tap. The tapper comes complete with two work-holding jaws and special tap chuck. Also available: New ½" Hand Tapper, for larger and heavier work.



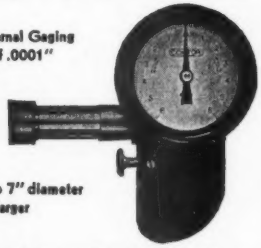
TOOL SPECIALTIES CO.

RAYMOND-COMMERCE BLDG. NEWARK 2, N. J.

Modernize your gaging routine by using

COMTORPLUG

Precision Internal Gaging to fractions of .0001"



Sizes: ¼" to 7" diameter and larger

This up-to-date gage has supplanted conventional methods because superior both in accuracy and certainty of performance. Equally successful when used by machine operator, bench inspector and final checker, it improves coordination, lowers rejects and speeds production. Now readily available.

REQUEST BULLETIN 29

The COMTOR Co.

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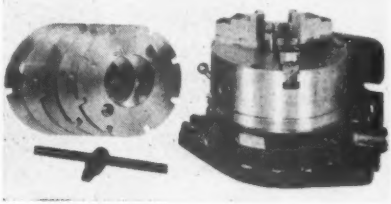
HARTFORD SUPER-SPACER

The versatile Super-Spacer is a complete ready-to-go-to-work unit with mask plates, reversible jaw, self-centering chuck and sliding handle chuck wrench. Rugged, compact and balanced for resisting distortion and absorbing the vibration of working stresses, the Super-Spacer provides a substantial and accurate indexing foundation at a minimum cost. Ask for Bulletin No. S-101.



THE HARTFORD SPECIAL MACHINERY CO.

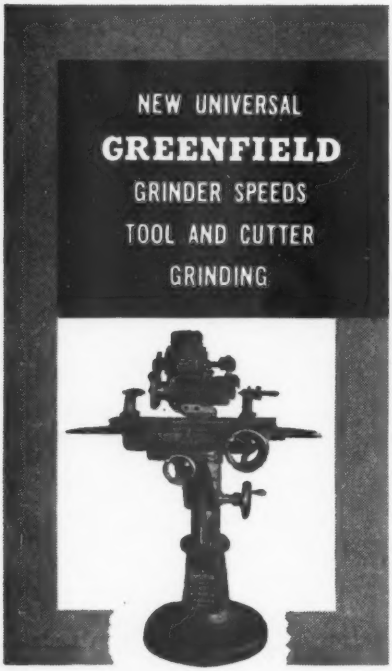
DUPLEX M-6
BAND AND DISC GRINDER

The latest in pedestal type grinders. Actually two machines in one! 14" disc for all rough work . . . 6 x 48" band for finishing. Precision-built to meet wartime production standards — quickly, economically!

Other styles and sizes in New Booklet on Finishing—Write Today

WALLS SALES CORP.

97 Warren Street New York 7, N. Y.



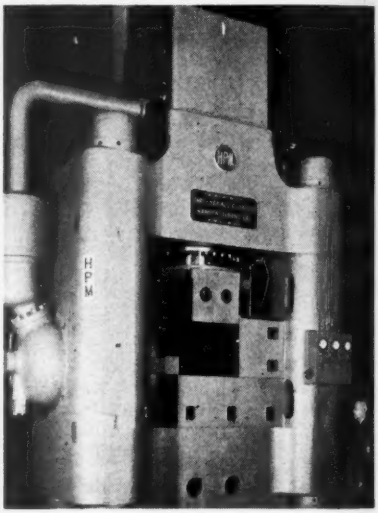
The rugged GREENFIELD No. 4 Tool & Cutter Grinder is serving industry as an invaluable production and toolroom machine. The spindle design of the new and improved GREENFIELD Wheel Head incorporates generous bearing areas—scraped to fit and thoroughly run in. Quickly and easily set up attachments provide toolroom versatility for grinding formed cutters, taper and rose reamers, flat surfaces and compound angles. Send for detailed and illustrated job application bulletin.

PRODUCTION MACHINE CO.
GREENFIELD, MASS.

Hydraulic Press for Powder Metallurgy

The Hydraulic Press Manufacturing Company of Mount Gilead, Ohio, has produced one of the largest hydraulic presses ever built for powder metallurgy. The press was designed for briquetting powdered carbides of tungsten, titanium or tantulum for carbide cutting tools, dies and inspection gauges.

Mass production articles, subject to



high machining costs during production, are most suitable for powdered metal fabrication. There is no limitation to the metal which may be employed. It is common to work in iron, brass, bronze and steel.

The press illustrated will exert a 1500-ton downward acting force, and a 1000-ton horizontal acting force. The press is completely self-contained, being equipped with two H-P-M Hydro-Power radial hydraulic pumps which generate the operating pressure.

INFORM-A-GRAM KEY No. 328-R

★

A second White Star for continuous outstanding production achievement in completing wartime schedules was recently added to the "E" Flag of Heller Brothers Co., Newcomerstown, Ohio.

NEW Angle Adaptor

Converts any drill press into a versatile multi-purpose machine.

Permits any spindle angle . . . at any height . . . horizontally or vertically.

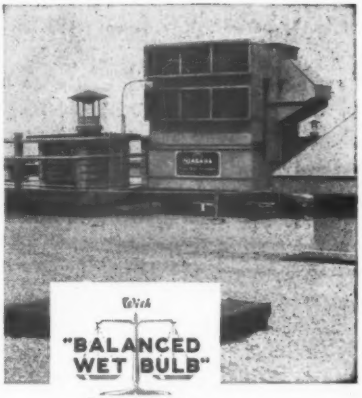
Simplifies clumsy operations . . . speeds production . . . eliminates operator fatigue.

Makes burring, sanding, buffing, grinding, angle drilling, polishing, rotary filing, wire brushing, tapping, reaming, honing, etc., more convenient, twice as fast!

Adaptable to all drill presses with tubular columns . . . rigid construction . . . POSITIVE LOCKING. Write now for descriptive literature, details.

NOBUR MANUFACTURING CO.
908 North Orange Drive
Los Angeles 38, California

Assuring UNIFORM RESULTS in HEAT TREAT PRODUCTION



U. S. Patent Re-issue No. 22,533

● The NIAGARA Aero HEAT EXCHANGER constantly maintains correct quench temperature, cooling or heating, as determined by the rate of heat input or load fluctuations. This is accomplished by the Niagara patented "Balanced Wet Bulb" control which automatically uses the correct mixture of fresh outdoor air with air re-circulated.

The NIAGARA Aero HEAT EXCHANGER employs the evaporative principle of cooling, eliminating costly water bills and protecting the user from the risk of interrupted water supply. Its direct savings quickly repay for its installation. Write for Bulletins 90 and 96.

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TOOL & DIE JOURNAL

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THE Tool & Die Journal Know-How Library is a series of manuals being prepared by specialists having the practical, shop know-how in their respective fields.

Metal working processes, techniques and materials including plastics, will be treated comprehensively and authoratively.

A number of "Know-Hows" are in preparation, and the first two are now ready. These are:

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"BRIEF SURVEY OF PLASTICS"

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A concise introduction to the leading plastics materials, molding and fabricating methods. Already in use in training programs and sales engineering conferences.

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A historical and detailed, step-by-step presentation of the methods of generating, by scraping, master surface plates, straight edges and 30°, 45°, 60° and 90° angles.

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Catalin Corporation Advances Two

The Board of Directors of the Catalin Corporation of America announce two important changes in top personnel—Alan N. Mann was elected Chairman of the Board and Harry Krehbiel was elected President and Chief Executive Officer.

Alan N. Mann

Mr. Mann has been associated with the company for about eleven years as Patent Counsel and as a Vice-President and Director. Mr. Krehbiel has been with the corporation for the past 13 years and has served as a Vice-President and Director since 1941.

Harry Krehbiel

At the same time the Board named Leo Beck as First Vice-President and Robert Frese was renamed as Secretary and Treasurer. The Catalin Corporation is a leading producer of cast resins, molding compounds and liquid resins. This company has been a leader in the research for and application of casting resins used in plastic tooling, particularly in the aircraft shop.

Engineered Plastics

Plastic Manufacturers, Inc., Dept. TD, 285 Fairfield Ave., Stamford, Conn., has issued a file type booklet in loose leaf form describing the complete design engineering, tool and mold building, injection and transfer molding, assembly, finishing and inspection facilities available to the plastics industry. A number of individual sheets featuring functional design in plastics illustrate some of the outstanding jobs designed, molded and assembled by this organization. There is also a reprint of an article on the molded turret swivel joint used on the Martin power-operated gun turret.

INFORM-A-GRAM KEY No. C6-R

Ask for Catalog YF

The most complete catalog of its kind. Lists 5000 different shapes, sizes and cuts of GROBET Precision Swiss Files. Ask also for catalog YM on files for filing machines.

Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability—since 1812.

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SAFETY "WEDGE GRIP" STEEL HAND STAMPS

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Just brush on deep Die Blue. Dries at once. Your check lines show clearly, no glare. Also used for original die, tool and pattern layouts. Sample on request.

HANDY 4 oz. Brush-in-can	.40
PINT	.80
QUART	.90
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DAYTON ROGERS MANUFACTURING CO. 2644 12th Ave. S., Minneapolis 7, Minn.

REFRIGERATION FOR

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Heat treated aluminum rivets and sheets must be kept in a dead soft condition until used or fabricated. Heat treated aluminum age hardens very rapidly at atmospheric temperatures — becomes so brittle it can't be fabricated.

But if its temperature is promptly reduced to minus 40° F. and held at that temperature, the metal remains workable.

Kold-Hold has specialized in the engineering and manufacture of refrigeration equipment to keep heat treated aluminum dead soft. This includes the refrigerated quench, the refrigerated alcohol bath, the canisters for packaging rivets, storage cabinets and mobile cabinets to take rivets to the assembly line.

KOLD-HOLD MANUFACTURING CO

445 NORTH GRAND AVENUE

LANSING 4, MICHIGAN

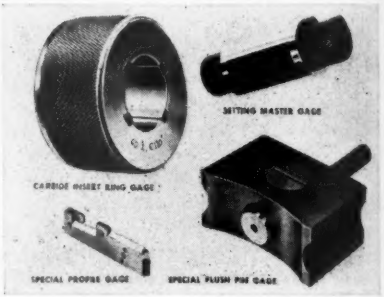
WRITE to KOLD-HOLD for CATALOG S-Z 431

KOLD-HOLD

Steel, Chrome Plate and Carbide Gages by Crescent

A complete line of precision gages to meet standard or special gaging requirements is available from the Crescent Tool and Die Company. Plug, ring, flat plug, profile, flush pin, snap, and build-up gages are available in a full range of standard sizes and tolerances. Standard gages are built to American Gage Design Committee specifications. Special gages are manufactured to purchaser's blueprints.

Crescent gages are offered in any of three materials, steel, chromium plate, or carbide, according to the demands of



the particular job. Chromium plate and carbide are designed for long production runs or for use with highly abrasive materials as they offer greater resistance to wear.

All Crescent gages are held to extremely close limits, while an extra smooth and durable finish is the result of careful, controlled grinding and lapping. Rigid final inspection and aging by cold treating are utilized to insure absolute precision and stability.

In addition to standard and special gages, Crescent also produces small jigs and fixtures and special tool details. Additional information is contained in illustrated literature which may be secured from the Crescent Tool and Die Co., Dept. TJ, 1469 Electric Ave., Lincoln Park, Mich.

INFORM-A-GRAM KEY No. C13-R

The HAMILTON MUEHLMATT Super Sensitive DRILLING MACHINE

SAVE ON SMALL DRILLS

THE HAMILTON TOOL CO.
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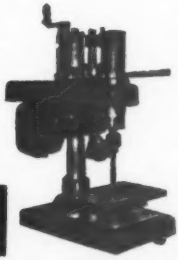
HAMILTON OHIO



USE THE HAMILTON FOR PRECISION DRILLING .004" to 5/16" DIA.

Rely on this drill to do your most exactingly precise drilling — and wherever "specs" call for absolute conformance to rigid inspections.

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MODEL W-SR 55,000 RPM

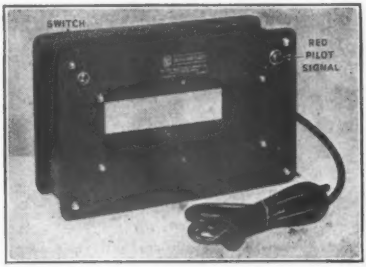
A production tool, smooth in operation, engineered to fill a broad field where a fast bench unit can be used most advantageously. It saves time by taking the part to be machined to the grinder instead of taking the grinder to the part as in the case of a portable tool. It leaves the operator with both hands free with which to handle the work; the result, much more production. 3 stages of power.

WRITE FOR LITERATURE

M·B PRODUCTS
130-134 E. LARNED ST.
Detroit 26, Michigan, U.S.A.

AMC DEMAGNETIZER

A Tool Room Necessity



Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

Available for either 115 V. or 220 V.

Write for full information.

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STURDY • DURABLE • HANDY

Capacity 7/16" hole through 1/4" steel or 3/8" hole through 5/16" steel.
All Parts Interchangeable - - - - - - - - - Weight 70 lbs.
Punches and dies carried in New York stock from 1/16" to 1/2" by 64ths. Also some drill numbered and commonly used square, flat and oval sizes.

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They will greatly simplify your Tool and Die program. They will speed up those many die jobs. They save 50 to 60% of the labor as compared to hand methods and permit the use of less skilled mechanics.

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Avoid cheap substitutes — buy the Original Oliver — a tried and proven tool—over 25 years of satisfactory service to thousands of users. Excellent delivery.

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Send for complete literature today—put this machine to work — you will find it to be the busiest tool in your shop. Model S-1 illustrated.

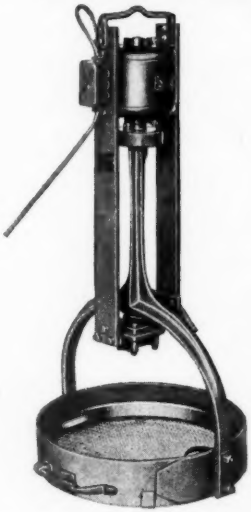
We also build Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Template Tool Bit Grinders, Point Thinners

OLIVER INSTRUMENT COMPANY

1436 E. Maumee St. Adrian, Michigan

Lowe Electric Riddle Has Many Uses

The Lowe Riddle is a high-speed sifter. It is designed to sift sand faster than a man can shovel it, hence at lower cost. The rotary action of the Lowe combined with a definite "bumping" or vibrating motion puts the sand through at high speed. For an average power cost of one cent, 4½ tons of facing sand or 6 tons of oil-based core sand can be sifted



per hour. Dust-proof wearing parts and a totally enclosed motor insure long life. The easily removable screen bottom can be changed quickly thus making it easy to use the proper mesh and easy to replace worn out bottoms.

This electric sifter has found frequent applications outside of the foundry field for which it was originally designed. Many concerns use it to riddle sawdust or other cleaning agents from off small parts of various kinds. Others are using it to rattle or "tumble" small parts in order to eliminate burrs and sharp edges and several manufacturers of plastics parts are knocking the fins from these small parts by shaking them in the Lowe Riddle.

Literature may be obtained from The Federal Foundry Supply Co., Dept. TJ, 4600 E. 71 St., Cleveland 5, Ohio.

INFORM-A-GRAM KEY No. C14-R

NUMBERING HEAD FOR METAL STAMPING

MODELS FOR HAND OR POWER PRESS

Combines strength with precision — the 143 Numbering Head does all types of metal indenting including the heaviest kind of power press work. Its simple design and clean-cut engraving guarantee sharp, true impressions. Adjustable for "consecutive" or "repeat" action, right or left hand operation. Available in 6, 7, and 8 wheel models, with Gothic or Roman type, as desired.

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Large Quill
4" Travel
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6 SPEEDS
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½ H. P. Motor

Specially engineered by RUSNOK to meet the demand for heavier duty end mill operations. Uses many types of cutters on a wide range of work. Large size spindle (No. 9 B & S taper). Takes ⅛" to ¾" end mills. Precision Engineered and Ruggedly Constructed Throughout.

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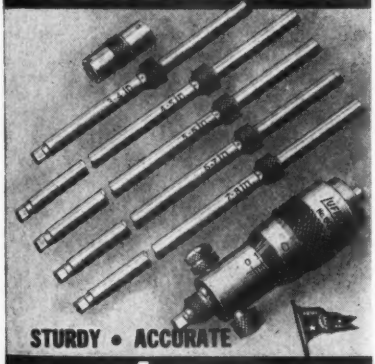

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Grand Rapids No. 60 Universal Cutter & Tool Grinders feature cabinet base, ball bearing table and fixed table height, backed by 35 years of know how.

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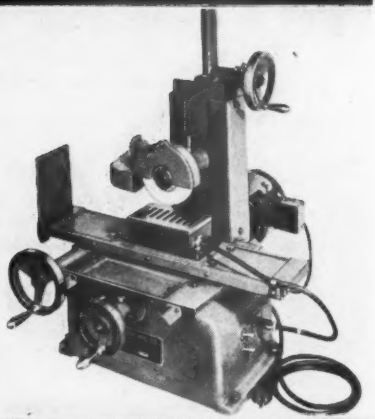
SANFORD



High-Speed **BENCH**
SURFACE GRINDER

ACCURATE WITHIN .0001

A sensitive machine built to rigid standards of accuracy and workmanship specially designed *"For the job that fits in your palm."*

PROMPT DELIVERY

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SANFORD MFG. CO.
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Irvington II, N. J.

Rolamarker is Handy Shipping Room Tool

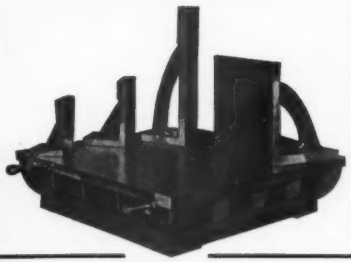
An exceptionally easy to operate marking tool called the Rolamarker has been developed by Adolph Gottscho, Inc., Dept. TD, 190 Duane St., New York 13, N. Y. Made to individual specifications it imprints single impressions such as manufacturer's trade mark, name and address, contents and other desirable information on boxes, cases and crates. The die drum automatically returns to the starting position for the next impression after an imprint is made and the operator removes the unit from the surface being marked. Space is provided on the drum

for over-travel so that more than one imprint will not be made. Automatically inked by one or two self-inking rollers, assemblies have been manufactured for imprinting in two or three colors side by side. These self-return Rolamarkers with interchangeable type are available to imprint areas from 1⅝" x 4" to 9" x 15". Further information is available from the manufacturer.
INFORM-A-GRAM KEY No. 44-R

(CONTINUED FROM PAGE 218)
the entire power is consumed within the heating chamber, maximum efficiency is achieved.

This new Model OFE furnace measures 21" wide, 31" high, and 18" deep; the heating chamber itself is 5½" wide, 4½" high, and 10½" deep. It is built for operation on either 115 or 230 volts. Thermo Electric Manufacturing Co., Dept. TJ, 474 W. Locust St., Dubuque, Ia.
INFORM-A-GRAM KEY No. 488-R

MILWAUKEE
Surface Plates



A full line of surface plates, angles and box parallels. Standard plate sizes from 8″x 8″ to 48″x 96″, larger sizes with or without legs. Plates are finish-planed and scraped to insure a very accurate surface.

Write for details

J. C. BUSCH CO.

Engineers & Machinists Since 1907

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SEE BETTER • WORK BETTER • Keep hands free

CARL ZEISS INC.

2¼x HEADBAND MAGNIFIER

Use of both eyes reveals true depth of details. Magnification of 2¼x. Free working distance, 8″ to 10″, permitting unhindered use of hands. By just lifting your head, your eyes are free for any other activity. Eyeglasses may be worn while using. Highest optical quality. Eyeshade of Tenite —practically unbreakable. *Write for leaflet.*

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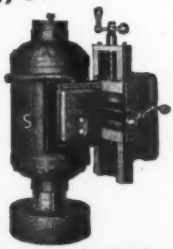
"RIGHT! YOUR MACHINE TOOL CAN NOW SERVE YOU AS A (STANDARD) GRINDER TOO."

YES SIR! You can now make your machine a "double purpose" machine, the "Standard Way". STANDARD VERTICAL SPINDLE GRINDERS can be easily mounted on your Planers, Boring Mills, Shapers, Milling Machines, etc., giving you added profits! Available with or without feeds, as preferred.



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FINISH - REAMS ALL METALS...

...removable blades shear in opposite directions simultaneously, reaming holes in practically any metal or plastic to close tolerances and mirror-smooth finishes. No honing necessary.

DUAL SPIRAL FLUTES

- ★ Eliminates Honing
- ★ .035″ to .080″ Expansion
- ★ Extensions for Line Jobs
- ★ Reams Smoothly Over Split Bushings

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REAMER AND MACHINE CO.

526 SO. MAIN STREET

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SURFACE PLATE EQUIPMENT

Masterpieces OF PRECISION
1 BOX PARALLELS

FOR setting and leveling to parallel and exact height for checking and inspection. Made from fine-grained, special analysis semi-steel castings, precision ground to the required accuracy.

Maintain fast production schedules with these shop-tested aids. Write for data and prices.

Other Surface Plate Equipment

★ V-Blocks—7 sizes
★ Universal Angle Irons—4 sizes
★ Angle Plates—22 sizes
★ Solid Parallels—14 sizes

494

Buy More Challenge War Bonds!

THE CHALLENGE MACHINERY CO.
GRAND HAVEN MICHIGAN

Cylindrical Work on Surface Grinders

The Strong Manufacturing Company, Dept. TD, 5312 Westminster Ave., Philadelphia, Pa., in the course of war production found it necessary to eliminate the necessity of using their large cylindrical grinders on small work. Consequently they developed the Strong Multi-

The STRONG Attachment in place on a Grinder

Purpose Grinder Attachment which is a simple device that can be quickly set up on a surface grinder in order to do cylindrical grinding, thereby greatly increasing the utility of a surface grinder.

The Strong Multi-Purpose Grinder Attachment has proven most helpful, not only in experimental work but in mass production work as well. A few of its uses are: shoulder grinding on cylindrical parts, circular form tools, plug gauges, reamers, counter bores, in fact any cylindrical grinding, either straight or angular within its capacity.

The attachment illustrated is Model

(TO PAGE 234—PLEASE)

Showing the Tilting of the STRONG Attachment

RussCo

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for Tool . . . Die . . . Pattern or Template Layout and Check Lines on Castings. All lines show up Clear . . . Sharp . . . and well defined.

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THE WONDER CUTTER

● Small enough to go in any out-of-the-way place—yet it cuts wire and rods up to ⅝ in. round (⅝-in. square) and band iron up to ½-in. by 2-in.

Adjustable stop for gauging the length of pieces. Hardened cutters that last indefinitely.

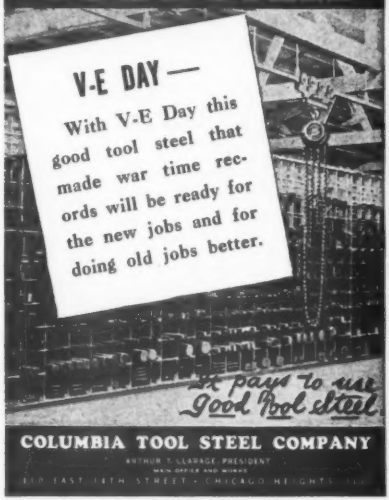
Get the "dope" on the lowest priced cutter out—

THE WONDER

The Federal Foundry Supply Co.

4608 East 71st St. Cleveland, Ohio

Columbia TOOL STEEL


V-E DAY —
With V-E Day this good tool steel that made war time records will be ready for the new jobs and for doing old jobs better.
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(CONTINUED FROM PAGE 232)

No. 1, which has a work capacity of 6" between centers and 6" diameter. The motor rotates the work and the device may be tilted forward or backward, giving any angle. The work is set by hand to the approximate angle desired, and a precision vernier final adjustment assures the exact angle. Being able to tilt in either direction allows grinding without removing the piece when obtaining right hand and left hand pitches.

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INFORM-A-GRAM KEY No. C15-R

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The Republic Gage Co., Dept. J, 2228 Fenkell Ave., Detroit 21, Mich., has just announced V-nide, a new, long-wearing, extremely hard gage development. The new V-nides derive their long-wearing qualities from an exceptionally hard case, Rockwell C 73-75, which is the result of a specially developed heat-treating process. This hard case is carefully drawn in order to remove the brittleness usually found in case hardening. One large user who has checked V-nides on the production line has reported 8 to 10 times more wear-life than that given by their ordinary tool steel gages. Other characteristics of V-nide include: same coefficient of expansion as steel, tough core under hard surface, same "feel" as tool steel gages, takes a high finish, and is offered at a comparatively small increase in cost.
INFORM-A-GRAM KEY No. 923-R

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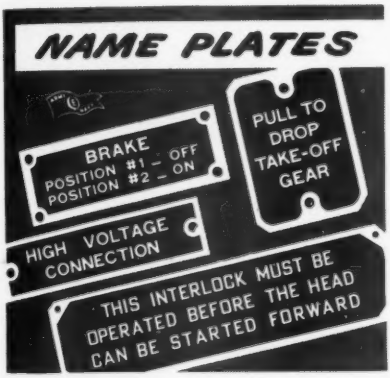
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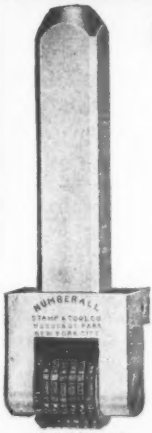

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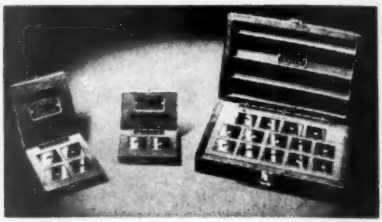
Hoke Type Carbide Gage Blocks

Lincoln Park Industries, Inc., Lincoln Park 25, Mich., announce the addition to their line of gages and precision tools a new product—Carblox cemented-carbide gage blocks in the Hoke (square) type.

As a series of wear blocks to be used on the ends of a gage block build-up, Carblox provides the means to greatly reduce the wear error in gage block use,



supplement and increase immeasurably the useful, accurate life of gage block sets. They act as protective anvils, preventing wear on the less wear-resistant steel blocks. They can, of course, also be used as individual blocks.

Carblox are practically non-magnetic and are highly resistant to rust and corrosion. Their square Hoke form allows the blocks to be handled easily, provides large symmetrical working surfaces and greatly reduces wear by overcoming the tendency to wring the gage block together always in one direction.

Hoke type Carblox are .950" square with .260" holes and are available in either "A" accuracy (.000004") or "B" accuracy (.000008") in sets of two .050" or .100", in sets of four (two each of .050" and .100") and in sets of fourteen varied sizes. This set of fourteen, supplemented with the standard 81-piece set of gage blocks, provide build-ups of practically any desired range. Special size Hoke type Carblox can be furnished.
INFORM-A-GRAM KEY No. 368-R

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Firth Sterling Steel Company, McKeesport, Pa., has received word that it has won for the third time the Army-Navy Production Award for high achievement in production of war material.

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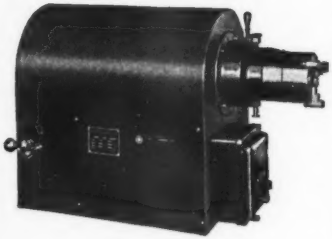

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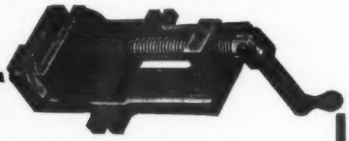

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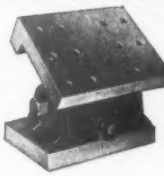

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20" long x 12" wide x 6½" deep.
16 ga., drag holes and handles both ends.

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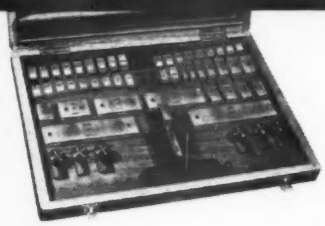
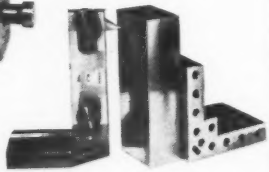
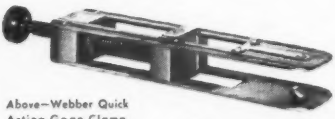
WEBBER *Announces* *The Heavy Duty* GAGE SET



Left—Webber Eccentric Clamp used to unite several blocks quickly into one solid, accurate gage.

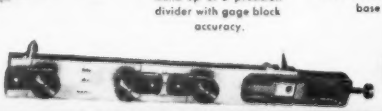
Below—Short height gage build up using the scriber point and base block assembly to lay out die work.





Above—Webber Quick Acting Gage Clamp

Below—Illustrates the build up of a precision divider with gage block accuracy.



Above—Illustrates method of assembling internal measuring jaws to check a hole—an inside or outside micrometer.

THE MOST USEFUL SET OF GAGE BLOCKS EVER DEVELOPED

Here's a set of gages made to order for the tool and die maker and machine tool operator bringing him a practical method for obtaining dependable precision measurements in millionths of an inch.

With this set, you can build up instantly precision instruments for checking inside and outside diameter measurements—scriber point with accurate base block assembly for laying out die work—a precision divider of various radii with gage block accuracy—height gages made up of precision Webber gage blocks for exceptionally close tolerance work.

The use of Webber Eccentric Clamp and Quick Acting Gage Clamp permits quick—accurate assembly of precision gage blocks for precision measurements of all kinds within the working range of the set.

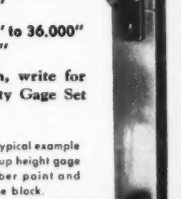
Webber offers two ranges of Heavy Duty Gage Sets:

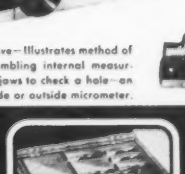
No. 24—Range from .300" to 24.000" in steps of .0001"

No. 36—Range from .300" to 36.000" in steps of .0001"

For detailed description, write for the Webber Heavy Duty Gage Set bulletin.

Right—A typical example of a built-up height gage with scriber point and base block.





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ADVERTISERS INDEX

Abrasive Machine Tool Co..... 31
Accurate Bushing Company..... 194
Ace Abrasive Laboratories..... 235
Acme Industrial Company....166, 186
Acme Tool Company.....189, 213
Acromark Co., The..... 209
Advance Foundry Co., The..... 200
Allegheny Ludlum Steel Corp..... 2
Alsift Mfg. Co..... 227
American Industrial Publishers.....213, 224
Ames Co., B. C..... 160
Armstrong-Blum Mfg. Co..... 244
Armstrong Bros. Tool Co..... 215
Automotive Maintenance Machinery Co. (Ammco)..... 181

Baker Brothers, Inc..... 132
Barnes Co., Inc., W. D..... 134
Barth Stamping Machine Works.. 233
Beaver Machine & Tool Co..... 238
Behr-Manning (Division of Norton Company)..... 185
Bellows Company, The..... 73
Benchmaster Mfg. Co..... 133
Bergen Machine & Tool Co., Inc. 238
Besly Co., Charles H..... 53
Bissett Steel Co., The..... 198
Black Drill Company..... 154
Boggis & Co., Henry P..... 219
Boyar-Schultz Corp. 64
Brand Tool & Supply Co..... 219
Bunell Machine & Tool Co.....68, 69
Burke Machine Tool Co..... 196
Busch Company, J. C..... 231

Carborundum Company, The....12, 13
Challenge Machinery Co., The.... 232
Chicago Mfg. & Distributing Co. 55
Chicago Rawhide Mfg. Co..... 162
Chicago Screw Co., The..... 66
Chicago Wheel & Mfg. Co..... 85
Cincinnati Grinders, Inc..... 7
Cincinnati Milling Machine Co., The 6
Cincinnati Planer Co., The..... 44
Cincinnati Shaper Co., The..... 169
Clark Equipment Co..... 157
Clark Instrument, Inc..... 42
Clark Company, Robert H.....87, 207
Cleveland Tool Engineering Co... 242
Cleveland Twist Drill Co., The.. 98
Cleveland Universal Jig Co..... 238
Colonial Bushings, Inc..... 215
Columbia Tool Steel Co..... 233
Comtor Company, The..... 221
Conrad & Moser 238
Continental Machines, Inc..... 90
Cooley Electric Mfg. Corp..... 48
Cooper Bessemer Corp., The..... 131
Criterion Machine Works..... 197
Crucible Steel Company of America 29
Cullen-Friestedt Co. 199
Cunningham Company, M. E..... 225

Dakon Tool & Machine Co., Inc. 147
Danly Machine Specialties, Inc.. 84
Davis Tool & Engineering Co.... 238
Dayton Rogers Mfg. Co..... 225
Dearborn Gage Co..... 32
Deepfreeze Division of Motor Products Corp. 153
Denning Mfg. Co..... 238
Detroit Reamer & Tool Co..... 67
Detroit Stamping Co..... 206
De Vlieg Machine Co..... 136
Dickerman Mfg. Co., H. E..... 86
Die Supply Company..... 191
Douglas Machinery Co., Inc...51, 155
Dries & Krump Mfg. Co..... 238
Drexel-Betz Co. 238
Dumore Company, The..... 14
Dykem Company, The..... 219

Eastern Etching & Mfg. Co..... 235
Economy Engineering Co..... 62
Electrix Corporation 49
Enterprise Machine Parts Corp... 8
Erickson Steel Company.....16, 17
Evans Reamer & Machine Co..... 231
Ex-Cell-O Corp. 46

Federal Foundry Supply Company, The 233
Federal Tool Corp..... 96
Felker Mfg. Co..... 40
Firth-Sterling Steel Co..... 24
Fish-Schurman Corp. 192
Fonda Gage Company..... 28
Ford Mfg. Co., Inc., M. A..... 9
Ford Motor Co., Johansson Division 173

Gallmeyer & Livingston Co..... 229
Galter Mfg. Co. 234
General Die-Stamping-Tool Co... 37
General Die & Tool Co..... 238
General Engineering & Mfg. Co.. 195
Gibson Co., The, William D..... 203
Gorton Machine Co., George..... 187
Gottscho, Inc., Adolph..... 229
Griffin Co., George O..... 38
Grobet File Co. of America..209, 225

Hamilton Tool Co., The.....217, 227
Hammond Machinery Builders, Inc. 172
Hardinge Brothers, Inc..... 3
Hartford Special Machinery Co., The 221
Hartley Wire Die Co..... 219
Heller Brothers Co..... 23
Herman Stone Co., The..... 197
Hoggson & Pettis Mfg. Co., The 168
Holo-Krome Screw Corp., The... 5
Horis Screwlock Co..... 143
Hy-Pro Tool Co..... 210

Ideal Tool & Die Co., Inc..... 180
Illinois Tool Works 215
Industrial Machine Co..... 238
Industrial Products Suppliers.... 239

J & B Specialties Co..... 239
J & S Tool Co.....188, 218, 238
Janone Engineering Co. 236

Kalamazoo Tank & Silo Co..... 195
Kearney & Trecker Products Corp. 161
Kempsmith Machine Co., The... 95
Kiffer Tool & Die Co..... 238
Knu-Vise, Inc. 88
Kold-Hold Mfg. Co..... 226

Lakeside Steel Improvement Co., The 158
Lapointe Machine Tool Co..... 72
Latrobe Electric Steel Co..... 33
Lavallee & Ide, Inc..... 135
Leach Machinery Co., H..... 217
Lee Co., K. O..... 26
Lempco Products, Inc..... 11
Lewthwaite Machine Co., T. H... 227
Lima Electric Motor Co., The... 39
Linderme Machine & Tool Co., Inc. 204
Linley Brothers Co..... 189
Logan Engineering Co..... 27
Lorain Machine & Tool Co..... 238
Lucas & Son, Inc., J. L..... 239
Lufkin Rule Co., The..... 229

M-B Products 227
Majestic Tool & Mfg. Co..... 203
Marvel Tool & Machine Co..... 182
Master Gauge Co..... 205
Mattison Machine Works 146
McGrath St. Paul Co..... 217
McKinney Tool & Mfg. Co....18, 19
McMahon Co., Frank..... 239
Mead Specialties Co.....191, 201
Mercury Metal Die and Letter Co. 163
Metal Cutting Tools & Mfg. Co. 178
Meyers Company, Inc., W. F..... 30
Michigan Chrome & Chemical Company 190
Milwaukee Chaplet & Mfg. Co... 156
Minn-Kota Foundry & Mfg. Co. 235
Mohawk Tool Co..... 139
Moore Special Tool Co., Inc..... 41
Moreland Tool Company..... 94
Muehlhausen Spring Corp..... 171

National Twist Drill & Tool Co. 25
Newton Mfg. Co..... 205
Niagara Blower Co..... 223
Nichols-Morris Corporation 43
Nichols & Sons, W. H..... 36
Noble & Stanton, Inc..... 240

Nobur Mfg. Co..... 223
Norton Company 34, 74
Numberall Stamp & Tool Co..... 235

Oliver Instrument Company..... 228
O'Neil-Irwin Mfg. Co..... 59

Paramount Tool Co..... 238
Peerless Machine Co..... 179
Phillips & Company, C. E..... 63
Phoenix Machine Co..... 238
Pipe Machinery Co., The..... 71
Portage Machine Co., The..... 193
Potts Machine Co..... 167
Procunier Safety Chuck Co..... 211
Production Machine Co., The.... 222
Producto Machine Co., The..... 220
Putnam Tool Co..... 1

Rane Tool Co., Inc..... 238
Republic Gage Co..... 214
Robbins Engineering Co..... 92
Roberts Rubber Co., Weldon..... 193
Rockford Die & Tool Works, Inc. 238
Rockford Magnetic Products Co... 199
Rusnok Tool Works..... 222
Ruthman Machinery Co., The..... 239

Sanford Mfg. Co..... 230
Say-Way Industries 93
Schauer Machine 237
Scherr Co., Inc., George..... 58
Schraner & Co., A. P..... 238
Severance Tool Industries, Inc... 15
Sheldon Machine Co., Inc..... 60
Shore Instrument & Mfg. Co., Inc., The 236
Simpson Co., Russ..... 233
Skilsaw, Inc. 54
Smillie & Company, C. M..... 159
Smit & Sons, Inc., J. K..... 208
Smith Tool & Engineering Co.... 176
Sommer & Adams Co., The..... 243
South Bend Lathe Works..... 151
Springfield Machine Tool Co..... 177
Stackbin Corporation 174
Standard Electrical Tool Co., The 231
Standard Pressed Steel Co..... 211
Star Machine & Tool Co..... 145
Stark Tool Co..... 216
Sturdimatic Tool Co..... 57
Sun Tool Company..... 53
Sunnen Products Co..... 148
Swedish Gage Co. of America..... 201

Tannewitz Works, The..... 164
Taylor & Associates, Herbert G. 239
Taylor Machine Co..... 238
Thermo Electric Mfg. Co..... 170
Thomas Hoist Co..... 212
Timken Roller Bearing Co., The. 175
Tomkins-Johnson Co., The..... 30
Tool Specialties Company..... 221
Tools & Gages, Inc..... 141
Triangle Engineering Co..... 207
Tubular Micrometer Co., The..... 237
Turchan Follower Machine Co... 56
Turner Gauge Grinding Co..... 10
Turner Machinery Co..... 35

U. S. Machine Tool Mfg. Corp... 236
Universal Engineering Co.....61, 152, 184, 202

Vard, Inc. 65
Variety Machine & Stamping Co. 238
Viking Tool & Machine Corp... 240
Vinco Corporation 52

Wales-Strippit Corp. 91
Walker-Turner Company, Inc..... 47
Walls Sales Corp..... 221
Webber Gage Co..... 240
Welding Equipment & Supply Co. 175
Wells Mfg. Corp..... 22
West, B. C..... 239
Wheelock, Lovejoy & Co., Inc.... 237
Whistler & Sons, Inc., S. B..... 89
Wilson, K. R..... 50
Wilson Mechanical Instrument Co., Inc. 225
Wittek Mfg. Co..... 45
Wodworth Company, N. A..... 21
Wysenbeck & Staff, Inc..... 217

Yost Mfg. Co..... 237

Zeiss, Inc., Carl..... 221

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AMAZING NEW UNIVERSAL INDEXING HEAD OFTEN SPEEDS GRINDING 12 TIMES!

Grinding jobs normally requiring two to three hours of laborious trial and error work now can be done in just 5 minutes by this new method. The three-plane indexing head can do the job for you, as it did in this case:

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The Universal Indexing Head holds tools firmly, indexing 360° in each of three planes, for any possible simple or compound angle. It bolts onto any tool or surface grinder you may have. It gives you higher precision work because you needn't shift tool in holder. Vernier lever rotates work collet between adjacent indexed points without changing index, giving you control to 1/10 of 1 degree!

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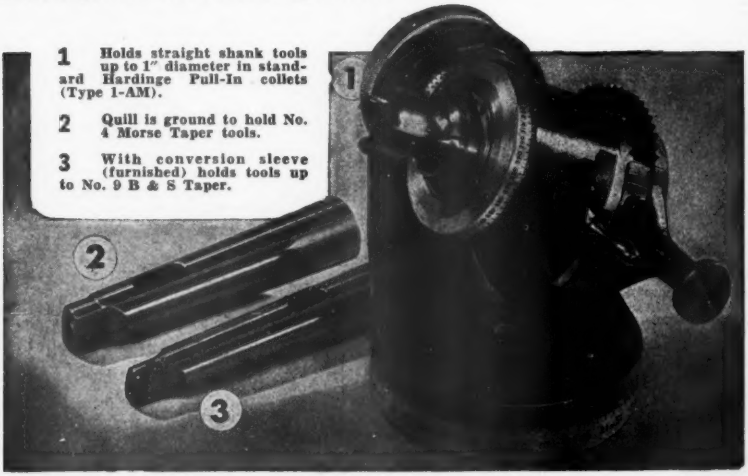
1 Holds straight shank tools up to 1" diameter in standard Hardinge Pull-In collets (Type 1-AM).
2 Quill is ground to hold No. 4 Morse Taper tools.
3 With conversion sleeve (furnished) holds tools up to No. 9 B & S Taper.
1
2
3

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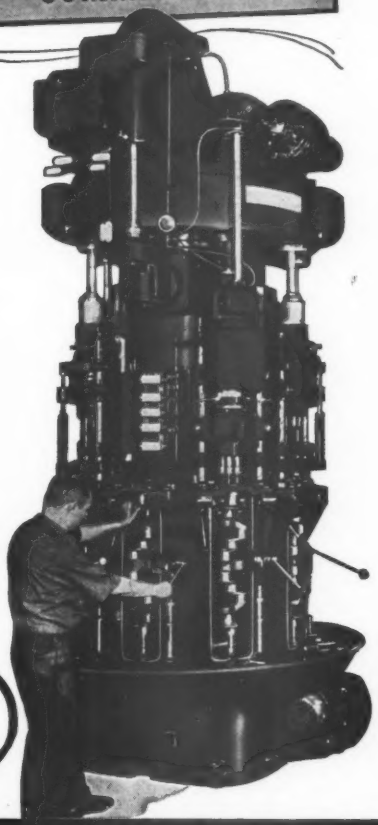

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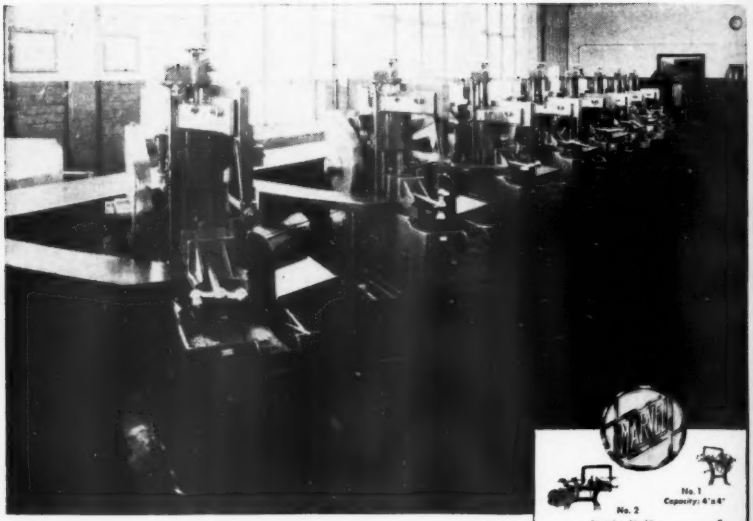

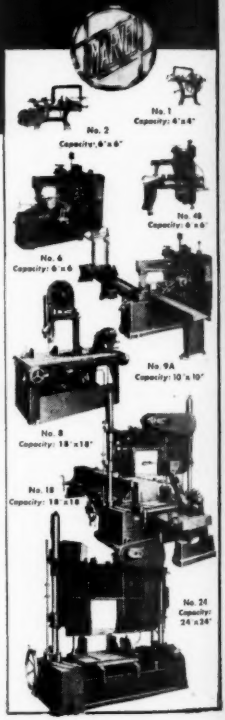

WHERE SPEED COUNTS MOST!

Increased steel production and more rigid inspection during the war has made it necessary for metallurgical laboratories to require hack saw machinery for specimen cutting of a wide variety of metals and alloys of almost any shape or size—in any condition of hardness.

The photos shown here illustrate how one large steel mill in the middle west has installed a battery of Marvel Hack Sawing Machines to crop and cut-off slices for metallurgical tests of large billets of tough alloy steels. This company, along with many other steel companies, has found that the Marvel Machine is the only one capable of cutting the hardest alloys fast and economically. The Marvel is the most universal cutting-off machine, built for heavy duty, continuous operation.

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